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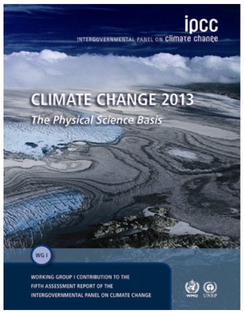

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Copies of the printed report are available from Cambridge University Press (http://www.cambridge.org/9781107661820) .

Summary Volume (SPM, TS & FAQs) into UN Languages New

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Drafts and Review Materials

Presentation

REGULATORY IMPACT ANALYSIS:
Development of Social Cost of Carbon Estimates

GAO-14-663: Published: Jul 24, 2014. Publicly Released: Aug 25, 2014.

What GAO Found

To develop the 2010 and 2013 social cost of carbon estimates, the Office of Management and Budget (OMB) and Council of Economic Advisers convened and led an informal interagency working group in which four other offices from the Executive Office of the President (EOP) and six federal agencies participated. Participating agencies were the Environmental Protection Agency (EPA) and the Departments of Agriculture, Commerce, Energy, Transportation (DOT), and the Treasury. According to several working group participants, the working group included relevant subject-matter experts and the agencies likely to use the estimates in future rulemakings. According to OMB staff, there is no single approach for convening informal interagency working groups and no requirement that this type of working group should document its activities or proceedings. However, OMB and EPA participants stated that the working group documented all major issues discussed in the Technical Support Document, which is consistent with federal standards for internal control. According to the Technical Support Document and participants GAO interviewed, the working group's processes and methods reflected the following three principles:

- ***Used consensus-based decision making.*** The working group used a consensus-based approach for making key decisions in developing the 2010 and 2013 estimates. Participants generally stated that they were satisfied that the Technical Support Document addressed individual comments on draft versions and reflected the overall consensus of the working group.
- ***Relied on existing academic literature and models.*** The working group relied largely on existing academic literature and models to develop its estimates. Specifically, the working group used three prevalent academic models that integrate climate and economic data to estimate future economic effects from climate change. The group agreed on three modeling inputs reflecting the wide uncertainty in the academic literature, including discount rates. Once the group reached agreement, EPA officials—sometimes with the assistance of the model developers—calculated the estimates. All other model assumptions and features were unchanged by the working group, which weighted each model equally to calculate estimates. After the academic models were updated to reflect new scientific information, such as in sea level rise and associated damages, the working group used the updated models to revise its estimates in 2013, resulting in higher estimates.
- ***Took steps to disclose limitations and incorporate new information.*** The Technical Support Document discloses several limitations of the estimates and areas that the working group identified as being in need of additional research. It also sets a goal of revisiting the estimates when substantially updated models become available. Since 2008, agencies have published dozens of regulatory actions for public comment that use various social cost of carbon estimates in regulatory analyses and, according to working group participants, agencies received many comments on the estimates throughout this process. Several participants told GAO that the working group decided to revise the estimates in 2013 after a number of public comments encouraged revisions because the models used to develop the 2010 estimates had been updated and used in peer-reviewed academic literature.

Why GAO Did This Study

Executive Order 12866 directs federal agencies to assess the economic effects of their proposed significant regulatory actions, including a determination that a regulation's benefits justify the costs. In 2008, a federal appeals court directed DOT to update a regulatory impact analysis with an estimate of the social cost of carbon—the dollar value of the net effects (damages and benefits) of an increase in emissions of carbon dioxide, a greenhouse gas.

In 2009, the Interagency Working Group on Social Cost of Carbon was convened to develop estimates for use governmentwide, and it issued final estimates in its 2010 Technical Support Document. In 2013, the group issued revised estimates that were about 50 percent higher than the 2010 estimates, which raised public interest.

GAO was asked to review the working group's development of social cost of carbon estimates. This report describes the participating entities and processes and methods they used to develop the 2010 and 2013 estimates. GAO reviewed executive orders, OMB guidance, the Technical Support Document, its 2013 update, and other key documents. GAO interviewed officials who participated in the working group on behalf of the EOP offices and agencies involved. GAO did not evaluate the quality of the working group's approach.

GAO is making no recommendations in this report. Of seven agencies, OMB and Treasury provided written or oral comments and generally agreed with the findings in this report. Other agencies provided technical comments only or had no comments.

For more information, contact J. Alfredo Gómez at (202) 512-3841 or gomezj@gao.gov.

EPA United States Environmental Protection Agency

Climate Change

Evaluating Climate Policy Options, Costs and Benefits

On This Page

EPA analyzes the anticipated economic effects of proposed standards and policies to reduce greenhouse gas emissions. These analyses have shown that there are a variety of cost-effective policies available to reduce greenhouse gas emissions.

Policy options range from comprehensive market-based legislation to targeted regulations to reduce emissions and improve the efficiency of vehicles, power plants and large industrial sources. Underlying these analyses are economic models and detailed studies of technologies to reduce emissions.

Common-sense Approaches Through the Clean Air Act

EPA is taking action under the Clean Air Act to reduce greenhouse gas emissions from the largest sources by increasing the efficiency of our power plants, cars, and trucks. Our analyses show that these regulations will save consumers money at the pump, improve the air we breathe, promote jobs in the green technology sector, and cut millions of tons of harmful greenhouse gas emissions.

- EPA's regulatory initiatives for greenhouse gases under the Clean Air Act
- Historical economic benefits from taking action under the Clean Air Act

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Analysis of Proposed Climate Legislation

Congress periodically proposes legislation to lower greenhouse gas emissions, and EPA economists analyze these bills as part of the legislative process. EPA analyses have shown that comprehensive, market-based climate legislation can transform the U.S. energy system and reduce greenhouse gas emissions, all at relatively low cost.

- EPA Legislative Analyses
- Climate Economic Modeling

Understanding Benefits

Taking actions to reduce greenhouse gas emissions yields important economic benefits. These benefits are from the reduced risk to human health and welfare that results from lower emissions of greenhouse gases and less global warming and climate change. EPA and other federal agencies have developed Social Cost of Carbon (SC-CO_2) estimates to assess the economic benefits of rulemakings that reduce carbon dioxide (CO_2) emissions. When agencies prepare to issue regulations implementing the laws enacted by Congress, they must justify proposed regulations by assessing their cost and benefits to the economy and society. The SC-CO_2 is typically used in the benefits part of the cost-benefit analysis. For a regulation that decreases emissions, the SC-CO_2 represents the damage avoided--or the benefit of the regulation--for marginal reductions of CO_2.

As discussed in the supporting technical documentation, (PDF, 21pp, 1.4MB) however, these benefit estimates are not complete because current models do not yet capture all of the important physical, ecological, and economic impacts of rising levels of CO_2 in the atmosphere that are recognized in the literature. Nonetheless, these estimates and the discussion of their limitations in the supporting technical documentation represent the best available information about the social benefits of CO_2 reductions to inform benefit-cost analysis.

EPA is exploring approaches to further understand the benefits of CO_2 reductions that complement the analysis conducted with the SC-CO_2. While the SC-CO_2 is a useful metric to assess marginal changes in CO_2 emissions in the context of cost-benefit analysis, bottom-up approaches, such as the Climate Change Impacts and Risks Analysis (CIRA) project, may offer additional insights about the impact of significant global action.

CIRA is a peer-reviewed study comparing impacts in a future with significant global action on climate change to a future in which current greenhouse gas emissions continue to rise.

In 2015, EPA released a report, Climate Change in the United States: Benefits of Global Action, estimating the physical and monetary benefits to the U.S. of reducing global greenhouse gas emissions. This report summarizes results from the CIRA. Although no specific mitigation policies were analyzed, the report shows that global action on climate change will significantly benefit Americans by saving lives and avoiding costly damages across the U.S. economy.

Research Underlying EPA Economic Modeling of Climate Policies:

Climate Economic Modeling

EPA uses a variety of economic models and analytical tools when conducting climate economic analyses of climate legislation or policy. These models help researchers estimate the future effects of proposed policies on energy production, the economy, emissions of CO_2, and land use trends in agriculture and forestry.

Air Quality and Climate Modeling

EPA is creating decision support tools to evaluate policy options for both air quality and climate change

Transportation Sector Analyses

EPA conducts modeling and feasibility analyses to understand the potential of technologies and strategies to reduce greenhouse gas emissions from the transportation sector.

International Emissions Projections for Non CO_2 Gases

EPA conducts studies of projected global emissions of the methane, nitrous oxide, and fluorinated greenhouse gases which account for about 30 percent of human-caused warming. Projected emissions studies for the non-CO_2 gases provide a benchmark that can be used to measure the potential environmental and economic impact of proposed climate policies across all relevant gases.

International Mitigation Technologies to Reduce Emissions of Non CO_2 Gases

Numerous technologies are available to reduce emissions of methane, nitrous oxide, and fluorinated greenhouse gases. EPA develops reports that evaluate the costs of various technologies to reduce non-CO_2 greenhouse gas emissions. These reports also provide cumulative marginal abatement cost curves which are used by researchers to represent mitigation costs in their models.

Last updated on October 6, 2016

NATURE CLIMATE CHANGE | LETTER

Temperature impacts on economic growth warrant stringent mitigation policy

Frances C. Moore & Delavane B. Diaz

Nature Climate Change **5**, 127–131 (2015) doi:10.1038/nclimate2481
Received 24 June 2014 Accepted 25 November 2014 Published online 12 January 2015 Corrected online **28 January 2015**
Erratum (March, 2015)

Integrated assessment models compare the costs of greenhouse gas mitigation with damages from climate change to evaluate the social welfare implications of climate policy proposals and inform optimal emissions reduction trajectories. However, these models have been criticized for lacking a strong empirical basis for their damage functions, which do little to alter assumptions of sustained gross domestic product (GDP) growth, even under extreme temperature scenarios[1, 2, 3]. We implement empirical estimates of temperature effects on GDP growth rates in the DICE model through two pathways, total factor productivity growth and capital depreciation[4, 5]. This damage specification, even under optimistic adaptation assumptions, substantially slows GDP growth in poor regions but has more modest effects in rich countries. Optimal climate policy in this model stabilizes global temperature change below 2 °C by eliminating emissions in the near future and implies a social cost of carbon several times larger than previous estimates[6]. A sensitivity analysis shows that the magnitude of climate change impacts on economic growth, the rate of adaptation, and the dynamic interaction between damages and GDP are three critical uncertainties requiring further research. In particular, optimal mitigation rates are much lower if countries become less sensitive to climate change impacts as they develop, making this a major source of uncertainty and an important subject for future research.

Subject terms: Climate-change impacts Climate-change policy Climate sciences Environmental economics

Change history

Corrected online 28 January 2015 In the version of this Letter originally published, in equation (1) and in the explanatory sentence following the equation, j_{TFP} should have read r_{TFP}. In the second line of the equation, $j_{\mathrm{DJO}_{j,t}}$ should have read $r_{\mathrm{DJO}_{j,t}}$. These errors have been corrected in the online versions of the Letter.

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Download references

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Contributions
F.C.M. and D.B.D. designed the analysis. D.B.D. performed the analysis. F.C.M. and D.B.D. analysed results and wrote the paper.

Competing financial interests
The authors declare no competing financial interests.

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Supplementary information

PDF files

1. Supplementary Information (1,327KB)

Nature Climate Change ISSN 1758-678X EISSN 1758-6798 This journal is printed on recycled paper Header image source: ESA/NASA

BLM

U.S. Department of the Interior
Bureau of Land Management

Environmental Assessment
DOI-BLM-ID-B010-2014-0036-EA

Little Willow Creek
Protective Oil and Gas Leasing

February 10, 2015

U.S. Department of the Interior
Bureau of Land Management
Four Rivers Field Office
3948 Development Avenue
Boise, ID 83705

Environmental Assessment # DOI-BLM-ID-B010-2014-0036-EA
Little Willow Creek Protective Oil and Gas Leasing

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Environmental Assessment # DOI-BLM-ID-B010-2014-0036-EA
Little Willow Creek Protective Oil and Gas Lease

1.0 Introduction

Leasing

The Mining and Minerals Policy Act of 1970 declares that it is the continuing policy of the Federal Government to foster and encourage private enterprise in the development of a stable domestic minerals industry and the orderly and economic development of domestic mineral resources. The Mineral Leasing Act of 1920, as amended, authorizes the Secretary of the Interior to lease federal oil and gas. The Bureau of Land Management (BLM) is the Interior agency delegated the authority to manage the United States' mineral resources. The BLM's oil and gas leasing programs are codified under 43 CFR 3100, in accordance with the authority of the Mineral Leasing Act of 1920, as amended, the Federal Land Policy and Management Act (FLPMA) of 1976, and the Energy Policy Act of 2005.

The decision as to which public lands and minerals are open for leasing and what leasing stipulations may be necessary is made during the land use planning process. Surface management/use for mineral extraction on non-BLM administered land overlaying federal minerals will be determined by the BLM in consultation with the appropriate surface management agency or the private surface owner at the time such surface use is proposed by the leaseholder or designated agent. Under the Mineral Lease Act, issuing oil and gas leases is a discretionary authority conveyed to the Secretary of Interior. In carrying out the mineral leasing authority conveyed through the Mineral Leasing Act, the BLM must comply with other applicable federal laws and regulations, including, but not limited to the Endangered Species Act, the National Historic Preservation Act, the Clean Water Act, the Clean Air Act, and the Energy Policy Act.

Offering federal mineral estate parcels for lease and subsequently issuing oil and gas leases are strictly administrative actions, which, in and of themselves, do not cause or directly result in any surface disturbance. Issuance of an oil and gas lease does convey to the lessee the exclusive right to use as much of the leased land as is reasonably necessary to explore for and extract oil and gas resources from the lease area, subject to the terms of the lease, including stipulations (43 CFR 3101.1-2 and 3101.1-3), regulations pertaining to oil and gas leasing, Onshore Orders, and with prior approval of the Authorized Officer. However, depending on lease stipulations, post-leasing activities may or may not result in impacts to surface resources. Only where stipulations or conditions do not preclude disturbance to surface resources is the action considered an irretrievable commitment of resources. The BLM may issue leases to protect the public interest when uncompensated drainage is occurring or may occur, provided the lease does not convey an irreversible or irretrievable commitment of resources.

As part of the lease issuance process, nominated parcels are reviewed against the appropriate land use plan, and stipulations are attached to mitigate any known environmental or resource conflicts that may occur on a given lease parcel. As stated above, on-the-ground impacts would potentially occur when a lessee applies for and receives approval to explore, occupy and/or drill on the lease. The BLM cannot determine at the leasing stage whether or not a lease would actually be explored or developed.

Oil and gas leases are issued for a 10-year period and continue for so long thereafter as oil or gas is produced in paying quantities. If a lessee fails to produce oil and/or gas, does not make annual rental payments, does not comply with the terms and conditions of the lease, or relinquishes the lease, then ownership of the minerals leased revert back to the federal government and may be offered for lease again. Drilling wells on a lease is not permitted until the lessee or operator secures BLM's approval of a drilling permit and a surface use plan as specified in 43 CFR 3162.3-1 (Drilling applications and plans) and submits a reclamation bond. Subsequent well operations, such as re-drilling, deepening, repairing casing, plugging-back, performing non-routine fracturing jobs, etc. also require the prior approval of the authorized officer (43 CFR 3162.3-2).

Leasing in the Four Rivers Field Office

While parcels totaling over 180,000 acres of federal land in southwest Idaho have been nominated for competitive oil and gas leasing, BLM has to-date deferred leasing any lands until completion of the Four Rivers Resource Management Plan/EIS (FRMP). Currently, there are no federal oil and gas leases in the field office. The FRMP will replace the 1987 Cascade RMP which currently addresses leasing in the western portion of the Four Rivers Field Office. BLM is considering leasing in this isolated circumstance because of the federal mineral reserve drainage that may occur existing wells are put into production in sections with federal minerals in the Willow Field or on private lands in the proposed leasing area.

There are currently 15 wells that have been drilled on private or State leases in and/or near the Willow and Hamilton Fields and are capable of production, and three wells that have been approved but haven't been drilled. Four existing wells and two proposed wells are within 0.5 miles of federal mineral resources. Several of the wells are located in sections with federal mineral estate (Map 1). The existing wells are classified as "shut in pending a pipeline" indicating that they are capable of production.

The BLM determined the boundary of the proposed leasing area by including all lands with federal minerals in the industry-designated Willow Field, as well as those lands with federal minerals located in sections that are within one mile of a well that has been drilled or permitted. Only the lands with federal minerals would be leased within the proposed leasing area boundary. There are no lands with federal minerals in the Hamilton Field.

In November 2013, Alta Mesa Services, Inc., a company that is currently developing a newly discovered natural gas field, made application to the Idaho Oil and Gas Conservation Commission (IOGCC) to omit federal lands in T. 8 N., R. 4 W., Section 3, from a drilling unit it proposed in Section 3. If the federal minerals are omitted from the drilling unit and a producing well is drilled on the private lands (with private minerals) in Section 3, drainage of the federal mineral estate could occur. The opportunity to recover the underlying resource would be lost, and the federal government, acting on behalf of the American taxpayer, would be unable to collect royalties on the extracted mineral resources.

Leasing would protect the American taxpayers' correlative rights, and production royalties could be collected. The BLM considers Alta Mesa's application to the IOGCC to be evidence of potential drainage in Section 3. Lands that are otherwise unavailable for leasing may be leased if there is an imminent threat of drainage [see 43 CFR 3120.1-1(d)]. Because of this threat and the likelihood of IOGCC receiving more applications to omit the federal mineral estate in sections where wells have been drilled or proposed, BLM is considering leasing the federal mineral estate within this limited area at this time.

1.1 Need for and Purpose of Action

The purpose of this proposal is to protect the federal mineral resource from uncompensated drainage, and surface resources from potential damage, in and near the Willow Field, Payette County, Idaho. Drainage is defined as the migration of oil and gas in an underground reservoir, due to a pressure reduction caused by production from wells bottomed in the reservoir. Because oil and gas are fluids, they can flow underground across property boundaries. Subsurface (i.e. mineral) ownership boundaries are the same as those upon the surface, projected downward to the center of the earth. Sub-surface mineral rights in the U.S. generally belong to the owner of the surface land, unless they have been severed from the surface. According to an old common law concept termed the rule of capture, the first person to gain control over the resource (by extracting the resource from the ground) gains exclusive ownership over that resource. In this way, an operator may permissibly extract, or drain, oil and gas from beneath the land of another, if the extraction is lawfully conducted on his own property. The rule of capture gives land owners an incentive to pump out oil as quickly as possible by speeding up their operations or drilling multiple, closely spaced wells to capture, or drain, the oil or gas resource of their neighbors. Very dense drilling can result in dissipation of the pressure within a reservoir, and therefore incomplete extraction of the resource.

To mitigate this danger, many state governments have sought to supersede the rule of capture with conservation acts that enforce prorationing, pooling, and limits on density of drilling, to avoid physical waste, ensure maximum ultimate recovery, and to protect the correlative rights of neighboring owners. The correlative rights doctrine is a legal doctrine limiting the rights of landowners to an oil or gas reservoir to a reasonable share, based on the amount of land owned by each on the surface above. Correlative rights concepts such as pooling and unitization replace the rule of capture in those states that have them, thereby protecting the rights of mineral estate owners from drainage.

Uncompensated drainage means that federal mineral resources are being produced by wells on adjacent lands without compensation to the United States in the form of royalties that would otherwise be required if the federal mineral estate were leased under the Mineral Leasing Act, as amended. A prime responsibility of the BLM is to protect the United States from the loss of royalty that results from drainage (uncompensated drainage). For unleased lands, the objectives of BLM's drainage protection program may be accomplished by leasing and requiring the lessee to take protective measures to prevent uncompensated drainage of oil or gas from the lease.

This action is needed because natural gas wells have been or are proposed to be drilled on private land adjacent to BLM-administered lands and/or adjacent to lands where BLM owns only the subsurface mineral estate (referred to as split estate). The current and proposed wells in and north of the Willow Field constitute a threat, or potential threat, of uncompensated drainage to the federal mineral estate. Drilling has resulted in the discovery of commercial quantities of natural gas and natural gas condensate in the Willow and Hamilton fields, and those areas are being developed for commercial production. According to the current Idaho well spacing order, only one well can be drilled per 640-acre governmental section (IDAPA 20.07.02.330.02; IOGCC 2013a). The Idaho Department of Lands has approved drilling permit applications for several wells on private lands which would drain minerals reserved to the United States within the well spacing unit designated by the State of Idaho (IOGCC 2014).

In a September 4, 2014 IOGCC hearing, the commission voted 4-1 to reconsider a request by Alta Mesa to omit federal mineral resources. If federal minerals are omitted from a drilling unit, BLM would be unable to collect the royalties it is due for its proportionate share of production from the drilling unit; therefore, the BLM considers these resources threatened by uncompensated drainage. While 43 CFR 3162.2-2 offers several protective measures BLM may take to avoid uncompensated drainage on unleased lands besides leasing, they require the cooperation of the owner-of-interest in the producing well. BLM has offered several times to enter into a communitization or compensatory royalty agreement; however. Alta Mesa has refused to do so, leaving leasing as the only alternative to address drainage.

1.2 Decision to Be Made

The responsible official will decide whether to recommend that the BLM Idaho State Office offer lands in the proposed lease area and which, if any, stipulations and/or notices should be attached to the leases.

1.3 Summary of Proposed Action

The BLM proposes to offer five parcels (totaling 6,349 acres; Map 2) at a spring 2015 competitive oil and gas lease sale. Stipulations and lease notices would apply on BLM-administered surface and subsurface in the lease area. The offering and subsequent issuance of oil and gas leases is strictly an administrative action, which, in and of itself, would not cause or directly result in any surface disturbance.

1.4 Location and Setting

The proposed 15,644-acre Little Willow Creek oil and gas lease area is located 4-12 miles east of Payette, Idaho (Map 1). The topography is characterized by gently rolling hills. Vegetation is dominated by annual and perennial grass with occasional shrub stands. Rural homes and agricultural fields are primarily associated with Little Willow Creek.

In the proposed lease area, only 6% of surface lands are BLM-administered and the remaining are privately owned; however, the BLM administers 41% of the subsurface mineral estate. Two oil and gas fields to the south have been designated by oil and gas developers. The Willow Field overlies a portion of the Little Willow Creek proposed lease area and currently has eight oil and gas wells. Further south, the Hamilton Field has six wells. Most wells in the area are classified as shut in pending a pipeline (IOGCC 2014).

1.5 Conformance with Applicable Land Use Plan

Leasing is in conformance with the 1988 Cascade Resource Management Plan (CRMP) which makes 456,289 acres (94% of area) available for leasable mineral exploration and development (CRMP Record of Decision page 3). The proposed lease parcels are within the area determined available for leasable mineral exploration and development. The CRMP directs the BLM to manage geological, energy, and minerals resources on the public lands so that significant scientific, recreational, ecological and educational values will be maintained or enhanced. Generally, the public lands are available for mineral exploration and development, subject to applicable regulations and Federal and State laws. The CRMP states that: "Approval of an application for lease is subject to an environmental analysis and may include stipulations to protect other resources." Additional NEPA documentation is needed prior to leasing to address new circumstances or information bearing on the environmental consequences of leasing that was not considered within the broad scope analyzed in the CRMP Environmental Impact Statement.

1.6 Relationship to Statutes, Regulations, and Other Requirements

This EA was prepared in accordance with the National Environmental Policy Act of 1969 (NEPA) and in compliance with all applicable laws and regulations, including Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508), U.S. Department of the Interior (DOI) requirements (Department Manual 516, Environmental Quality), and/or other federal statutes and executive orders.

Other applicable Federal laws to which the lessee must comply include but are not limited to, the following:

<u>Leasable Minerals</u>

It is BLM policy, as derived from various laws, including the Mineral Leasing Act of 1920 (MLA) and the Federal Land Policy and Management Act of 1976 (FLPMA), to make mineral resources available for disposal and to encourage development of mineral resources to meet national, regional, and local needs. Ensuring that the federal mineral estate is protected from uncompensated drainage of fluid mineral resources is a basic BLM function. 43 CFR 3100.2-1 states "Upon a determination by the authorized officer that lands owned by the U.S. are being drained of oil or gas by wells drilled on adjacent lands . . . Such lands may also be offered for lease in accordance with part 3120 of this title." 43 CFR 3120.1-1 states that "All lands available for leasing shall be offered for competitive bidding under this subpart, including but not limited to . . . (d) Lands which are otherwise unavailable for leasing but which are subject to drainage (protective leasing)."

Any purchaser of a federal oil and gas lease is required to comply with all applicable federal, state, and local laws and regulations, including obtaining all necessary permits required prior to the commencement of project activities.

Environmental Quality

Clean Water Act of 1972 (33 U.S.C. §1251 et seq.): Regulates surface water discharges and storm-water runoff. Section 313 requires federal agencies be in compliance with all federal, state, interstate, and local requirements. In Idaho, the Idaho Department of Environmental Quality (IDEQ) implements the Clean Water Act. Additionally, the IDEQ develops total maximum daily loads (TMDLs) for water bodies.

Safe Drinking Water Act of 1974 as amended: Authorizes the U.S. Environmental Protection Agency (EPA) to set national health-based standards for drinking water to protect against both naturally-occurring and man-made contaminants that may be found in drinking water. The EPA, IDEQ, and others work together to make sure that the standards are met.

Clean Air Act of 1970 as amended (42 U.S.C. §7401 et seq.): Sets rules for air emissions from engines, gas processing equipment and other sources associated with drilling and production activities.

Special Status Species

Endangered Species Act (ESA) of 1973 as amended (16 USC 1531): Section 7 of the ESA outlines the procedure for federal interagency cooperation to conserve federally listed species and their designated habitats. Section 7(a) (2) of the ESA states that each federal agency shall, in consultation with Secretary, ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of a listed species' habitat within the project area.

Special Status Species Management Manual for the Bureau of Land Management (BLM Manual 6840): National policy directs BLM State Directors to designate sensitive species in cooperation with the state fish and wildlife agency. This manual establishes policy for management of species listed or proposed for listing pursuant to the ESA and Bureau sensitive species that are found on BLM-administered lands; this policy is to conserve and to mitigate adverse impacts to sensitive species and their habitats. Where relevant to the activities associated with this action, effects to special status species are analyzed in this EA.

Migratory Bird Treaty Act, *Executive Order 13186*, and *BLM Memorandum of Understanding WO-230-2010-04* (between BLM and US Fish and Wildlife Service [USFWS]): Federal agencies are required to evaluate the effects of proposed actions on migratory birds (including eagles) pursuant to the *National Environmental Policy Act of 1969* (NEPA) "or other established environmental review process;" and restore and enhance the habitat of migratory birds, as practicable. Federal agencies are also required to identify where unintentional take reasonably attributable to agency actions is having, or is likely to have, a measurable negative effect on migratory bird populations. With respect to those actions so identified, the agency shall develop and use principles, standards, and practices that will lessen the amount of unintentional take, developing any such conservation efforts in cooperation with the Service. Effects to migratory birds are analyzed in this EA.

Bald and Golden Eagle Protection Act of 1940 as amended (16 USC 668-668d): This act provides for the protection of bald and golden eagles by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds. Agencies are required to evaluate: 1) whether take is likely to occur from activities associated with the proposed activity and 2) the direct, indirect, and cumulative impacts the proposal may have on the ability to meet the preservation standard of the Act that the USFWS has interpreted to mean "compatible with the goal of stable or increasing breeding populations." Effects to bald and golden eagles are analyzed in this EA.

Cultural Resources

Idaho BLM has the responsibility to manage cultural resources on public lands pursuant to the National Historic Preservation Act of 1966 (as amended), the 2012 Programmatic Agreement Among the Bureau of Land Management, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers and the State Protocol Agreement Between the Idaho State Director of the BLM and the Idaho State Historic Preservation Officer (1998) and other internal policies.

Social and Economic

Executive Order 12898 (February 1994): Federal agencies are directed to "make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations," including tribal populations. The accompanying Presidential Memorandum emphasizes the importance of using the NEPA review process to promote environmental justice.

1.7 Scoping and Development of Issues

Scoping

BLM began scoping for the Little Willow Creek lease sale on July 8, 2014 when the Four Rivers Field Manager sent a scoping packet and/or letter to all land owners with property in or adjacent to the Little Willow Creek proposed lease area and to the Four Rivers Field Office's interested public mailing list seeking scoping comments on the lease proposal. BLM also activated a web page on the BLM NEPA Register to make scoping and informational materials available to the public. The webpage can be reviewed at: https://www.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=39064&dctmId=0b0003e8806d22d8.

On Thursday July 17, 2014 the BLM hosted a public meeting at the Payette County Courthouse. BLM answered questions and accepted comments at the meeting and provided an address and website to send in additional scoping comments about the proposed leasing. Approximately 45 people attended the meeting and 12 individuals and organizations provided scoping comments. Many of the issues were outside the scope of the leasing decision. The public was primarily concerned with drilling which would be analyzed in a subsequent NEPA document if an Application for Permit to Drill (APD) is received by BLM (Appendix 1). The intent of BLMs scoping effort was to identify issues related to the proposed leasing.

<u>Issues Development</u>
Issues may be defined as a point or matter of discussion, debate, or dispute about a proposed action based on the potential environmental effects (BLM Handbook H-1790-1). Issues are concerns directly or indirectly caused by implementing the proposed action; these are used to develop alternatives to the proposed action. Relevant public comments and issues were used in the development of this EA, including those received in response to the Scoping Document mailed July 8, 2014. Comments not considered issues to analyze in this EA are ones that are: 1) outside the scope of the proposed action and thus irrelevant to the decision being made; 2) already decided by law, regulation, RMP, or other higher level decision; 3) conjectural and not supported by scientific or factual evidence; or 4) not necessary for making an informed decision. The following issues were identified from comments and scoping letters received during the scoping effort:

1. Leasing could indirectly impact air quality in the proposed lease area if exploration and development occur.
2. Leasing could indirectly impact water quality in the proposed lease area if exploration and development occur.
3. Leasing could indirectly pollute ground water in the proposed lease area if exploration and development wells require hydraulic fracturing (fracking).
4. Leasing could indirectly impact sensitive plant species in the proposed lease area if exploration and development occur.
5. Leasing could indirectly impact sensitive wildlife species in the proposed lease area if exploration and development occur.

These issues are addressed in Section 3.0. Although development in the Willow and Hamilton fields has not indicated the need for substantial fracking (Johnson et. al. 2013), the issue is addressed primarily in Water Resources (Section 3.5). The IDT also analyzed the indirect effects of leasing on the following resources: soils, vegetation, cultural resources, recreation, visual resources, lands and realty, livestock management, minerals, and social and economics.

2.0 Description of the Alternatives

2.1 Alternative A - No Federal Mineral Estate Leasing/Continue Present Management

The federal mineral estate in a 15,644 acre area in Payette County, including 996.85 (997) acres of BLM-administered lands and 5,352.35 (5,352) acres of split estate, would not be offered for lease. Development of State and private leases could occur in the area; however, the federal mineral estate would not be available at least until the FRMP is completed. State (Appendix 2) or other stipulations developed by the lessor and lessee would apply to other leases.

2.2 Alternative B – Leasing Federal Mineral Estate with No Surface or Subsurface Occupancy Stipulations

The federal mineral estate in a 15,644 acre area in Payette County, including 997 acres of BLM-administered lands and 5,352 acres of split estate, would be offered for lease in up to five parcels[A] (Table 1, Map 2, Appendix 3).

Table 1. Mineral estate acreages by parcel, surface, and subsurface ownership, proposed Little Willow Creek oil and gas leasing area, Payette County, Idaho.

Parcel	Federal Mineral Estate[1]			Other Mineral Estate[2]		Total
	Federal/Federal	Private/Federal	Total	Private/Private	Private/State	
A	212	1,536	1,748	3,811	0	5,549
B	237	312	549	1,353	0	1,903
C	235	1,140	1,374	1,142	0	2,516
D	274	1,311	1,585	1,186	394	3,165
E	39	1,052	1,091	1,313	98	2,502
Total	997	5,352	6,349	8,799	492	15,644

[1]Acreages presented in this table and throughout the document are rounded to the nearest acre. More accurate figures would be developed if a lease is offered.
[2] The BLM has no control over these resources. The values are provided strictly for informational purposes.

The following stipulations would apply to the federal mineral estate:

No Surface Occupancy (NSO) –1: Surface occupancy and use on BLM-administered and split estate lands would be prohibited until the Four Rivers Resource Management Plan (FRMP) is finalized.

No Sub-surface Occupancy (NSSO) –1: Subsurface occupancy and use on federal mineral estate lands would be prohibited until the FRMP is finalized.

Upon finalization of the FRMP, the leases would be modified by replacing NSO-1 and NSSO-1 with stipulations consistent with the FRMP. Development of State and private leases would be as described in Section 2.1; however, drainage of the federal mineral estate would be allowed and typical royalties would be applied.

[A] Because an oil and gas lease cannot be larger than 2,560 acres (43 CFR 3120.2-3), the 6,352-acre federal mineral estate was divided into smaller parcels. BLM has the discretion to parcel the lands in any configuration. During public scoping, at least one split estate land owner expressed a desire to bid on parcels to which he/she owns the surface estate. BLM has addressed the land owner’s concern by making the leases smaller, and by dividing the federal mineral estate in a manner that minimizes the number of split estate landowners on a single lease (the only exception to this is Parcel A, which has multiple split estate landowners, but lies entirely within the industry-designated Willow Field).

2.3 Alternative C - Leasing Federal Mineral Estate with Cascade RMP Stipulations and Additional Lease Notices

The federal mineral estate in a 15,644 acre area in Payette County, including 997 of BLM-administered lands and 5,352 acres of split estate, would be offered for lease in up to five parcels (Table 1, Map 2, Appendix 3). The leases would be subject to standard lease terms and the following stipulations associated with listed species (S-1) and cultural resources (S-2), applicable CRMP stipulations, and lease notices. Lease notices were developed for sensitive resources that were not addressed in the CRMP. Development of State and other leases would be as described in Section 2.1. The following stipulations and lease notices would apply where appropriate (Appendix 3):

Freshwater Aquatic Habitat

Controlled Surface Use (CSU) -1: Surface occupancy and use would be prohibited within 500 feet from the edge of reservoirs, ponds, streams, wetlands, and riparian habitat. Introduction of chemical toxicants or sediments to riparian areas as a result of exploration or production would not be allowed.

CSU-2: A minimum 100 foot riparian buffer zone would be provided from the edge of any riparian habitat to protect riparian vegetation, fisheries, and water quality. The following activities would be generally excluded: new road construction that parallels streams. Best management practices would be used when construction cannot be avoided.

Special Status Plant Species

CSU-3: Occupancy and use, including surface and subsurface rights-of-way, would be prohibited in Type 1-4 special status plant element occurrences.

Big Game Range[B]

CSU-4: No surface use would be allowed in crucial winter range from November 15 to May 15 or crucial antelope fawning range between May 1 and June 30.

Sensitive Wildlife Species

CSU-5: No surface use would be allowed within a 0.75 mile radius of ferruginous hawk or Swainson's hawk nests from March 15 to June 30.

CSU-6: No surface use would be allowed within a 0.75 mile radius of an osprey nest from April 15 to August 31.

CSU-7: No surface use would be allowed within a 0.25 mile radius of a burrowing owl nest from March 15 to June 30.

[B] From the CRMP: "Those areas where big game animals have demonstrated a definite pattern of use each year or an area where animals tend to concentrate in significant numbers (from Interagency Guidelines for Big Game Range Investigation-Idaho Department of Fish & Game, Bureau of Land Management, U.S. Forest Service)." For the purposes of this action, the BLM worked in cooperation with IDFG to delineate winter ranges using current animal distribution data.

Wildlife Species of Concern
CSU-8: No surface use would be allowed within a 0.75 mile radius of a golden eagle nest from February 1 to June 30.

CSU-9: No surface use would be allowed within a 0.75 mile radius of a prairie falcon nest from March 15 to June 30.

CSU-10: No surface occupancy would be allowed within a 0.5 mile radius of a heron rookery.

Fragile Soils
Lease Notice (LN) -1: The lessee is hereby notified that special location, design and construction mitigation measures may be required to minimize, to the extent possible, the potential long-term and short-term adverse impacts of oil and gas operations within fragile soils, and to avoid them wherever there is a practicable alternative.

Fragile soil areas, in which the performance objective would be enforced, are defined as follows:

1) Areas rated as highly or severely erodible by wind or water, as described by the National Cooperative Soil Survey for Payette County or as described by on-site inspection.
2) Areas with slopes ≥30%, if they also have one of the following soil characteristics:
    a. a surface texture that is sand, loamy sand, very fine sandy loam, fine sandy loam, silty clay or clay;
    b. a depth to bedrock <20 inches;
    c. an erosion condition that is rated as poor; or
    d. a K-factor >0.32.

Floodplain Management
LN-2: The lessee is hereby notified that special location, design and construction mitigation measures may be required to minimize, to the extent possible, the potential long-term and short-term adverse impacts of oil and gas operations within the 100-year floodplain associated with occupancy and modification of the floodplain, and to avoid direct and indirect floodplain development wherever there is a practicable alternative. Under Executive Order 11988: Floodplain Management; the BLM is required to restore and preserve the natural and beneficial values served by floodplains for actions related to federal activities and programs affecting land use.

Endangered Species (Mandatory)
Stipulation (S) –1: The lease area may now or hereafter contain plants, animals, or their habitats determined to be threatened, endangered, or other special status species. BLM may recommend modifications to exploration and development proposals to further its conservation and management objective to avoid BLM-approved activity that will contribute to a need to list such a species or their habitat. BLM may require modifications to or disapprove proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modification of a designated or proposed critical habitat. BLM will not approve any ground-disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable

requirements of the Endangered Species Act as amended, 16 U.S.C. § 1531 et seq., including completion of any required procedure for conference or consultation.

Special Status Mammals

LN-3: The lease may, in part or in total, contain important southern Idaho ground squirrel (SIDGS), a candidate species, and pygmy rabbit habitats as identified by the BLM, either currently or prospectively. The operator may be required to implement specific measures to reduce impacts of oil and gas operations on SIDGS populations and habitat quality. Such measures shall be developed during the application for permit to drill on-site and environmental review process and will be consistent with the lease rights granted. Measures may include (in order of priority):

1. Avoid areas occupied by SIDGS and pygmy rabbits.
2. When oil and gas facilities are deemed necessary within unoccupied SIDGS or pygmy rabbit habitat, minimize pad size, road width, and the size of other disturbed areas.
3. New construction of roads, pipelines, and rights-of-way would be planned to minimize the effects of fragmenting wildlife habitat.
4. Restore unneeded areas to native or other appropriate vegetation (shrubs, perennial grasses, and forbs as identified by the SIDGS Working Group) immediately upon vacancy of temporary use sites or permanent closure of well sites to provide forage for nearby SIDGS.
5. Construct power transmission lines outside of SIDGS occupied habitat (including a 0.25-mile buffer) whenever possible. If transmission lines are deemed necessary through or within 0.25 miles of SIDGS colonies, locate poles outside of active burrow systems and consider 1) burying transmission lines, or 2) installing raptor anti-perching devices on transmission lines.

Migratory Birds and Raptors

LN-4: The Operator is responsible for compliance with provisions of the Migratory Bird Treaty Act by implementing one of the following measures: a) avoidance by timing - ground disturbing activities would not occur from April 15 to July 15; b) habitat manipulation - render proposed project footprints unsuitable for nesting prior to the arrival of migratory birds (blading or pre-clearing vegetation must occur prior to April 15 within the year and area scheduled for activities between April 15 and July 15 of that year to deter nesting; or c) survey-buffer-monitor surveys would be conducted by a BLM approved biologist within the area of the proposed action and a 300 foot buffer from the proposed project footprint between April 15 to July 15 if activities are proposed within this timeframe. If nesting birds are found, activities would not be allowed within 0.1 miles of nests until after the birds have fledged. If active nests are not found, construction activities must occur within 7 days of the survey. If this does not occur, new surveys must be conducted. Survey reports would be submitted to the appropriate BLM Office.

CSU-11: No surface occupancy would be allowed within 1 mile of an active bald eagle or peregrine falcon nest. No surface use would be allowed from December 1 and March 31 where wintering bald eagles or peregrine falcons occur.

Water Quality

LN-5: The operator may be required to implement specific measures to reduce impacts of oil and gas operations on water quality and quantity. Such measures shall be developed during the application for permit to drill on-site and environmental review process and will be consistent with the lease rights granted.

Cultural Resources (Mandatory)

S-2: This lease may be found to contain historic properties and/or resources protected under the National Historic Preservation Act (NHPA), American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, E.O. 13007, or other statutes and executive orders. The BLM would not approve any ground disturbing activities that may affect any such properties or resources until it completes its obligations under applicable requirements of the NHP A and other authorities. These obligations may include a requirement that you provide a cultural resources survey conducted by a professional archaeologist approved by the State Historic Preservation Office (SHPO). If currently unknown burial sites are discovered during development activities associated with this lease, these activities must cease immediately, applicable law on unknown burials will be followed and, if necessary, consultation with the appropriate tribe/group of federally recognized Native Americans will take place. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized or mitigated.

LN-6: The Surface Management Agency is responsible for assuring that the leased lands are examined to determine if cultural resources are present and to specify mitigation measures.

Lands and Realty

LN-7: Land Use Authorizations incorporate specific surface land uses allowed on BLM-administered lands by authorized officers and those surface uses acquired by BLM on lands administered by other entities. These BLM authorizations include rights-of-way, leases, permits, conservation easements, and recreation and public purpose leases and patents.

Paleontological Resources

CSU-12: No surface occupancy would be allowed on sites with known paleontological values. Surface rights-of-way would be routed to avoid paleontological resources.

LN-7: This lease has is located in geologic units rated as being moderate to very high potential for containing significant paleontological resources. The locations meet the criteria for Class 3, 4 and/or 5 as set forth in the Potential Fossil Yield Classification System, WO IM 2008-009, Attachment 2-2. The BLM is responsible for assuring that the leased lands are examined to determine if paleontological resources are present and to specify mitigation measures. Guidance for application of this requirement can be found in WO IM 2008-009 dated October 15, 2007, and WO IM 2009-011 dated October 10, 2008. Prior to undertaking any surface-disturbing activities on the lands covered by this lease, the lessee or project proponent shall contact the BLM to determine if a paleontological resource inventory is required. If an inventory is required, the lessee or project proponent will complete the inventory subject to the following:

- The project proponent must engage the services of a qualified paleontologist, acceptable to the BLM, to conduct the inventory.
- The project proponent will, at a minimum, inventory a 10-acre area or larger to incorporate possible project relocation which may result from environmental or other resource considerations.

A paleontological inventory may identify resources that may require mitigation to the satisfaction of the BLM as directed by WO IM 2009-011 including possible project relocation which may result from environmental or other resource considerations.

2.4 Additional Considerations for Alternatives B-C

For split estate portions of the lease area, the BLM provided courtesy notification to private landowners that their lands are considered in this NEPA analysis and would be considered for inclusion in an upcoming lease sale. If any activity were to occur on such split estate parcels, the lessee and/or operator would be responsible for adhering to BLM requirements as well as formulating and reaching an agreement with the private surface landowners regarding access, surface disturbance, and reclamation (Onshore Oil and Gas Order No. 1). Standard lease terms, stipulations, conditions, and operating procedures would apply to these parcels (43 CFR 3101 and 3160 and 3162).

Standard operating procedures, best management practices, conditions of approval (COA), and lease stipulations could change over time to meet overall RMP and BLM policy objectives. The COA's would be attached to permits for oil and gas lease operations to address site-specific concerns or new information not previously identified in this environmental assessment process. In some cases new lease stipulations may need to be developed, and these types of changes may require an RMP amendment. For example, if climate change results in hotter and drier conditions, RMP objectives would be unreachable under current management. In this situation, management practices might need to be modified to continue meeting overall RMP management objectives. An example of a climate related modification is the imposition of additional conditions of approval to reduce surface disturbance and implement more aggressive dust treatment measures. Both actions reduce fugitive dust, which would otherwise be exacerbated by the increasingly arid conditions that could be associated with climate change.

Oil and gas leases would be issued for a 10-year period and would continue for as long thereafter as oil or gas is produced in paying quantities. If a lessee fails to produce oil and gas, does not make annual rental payments, does not comply with the terms and conditions of the lease, or relinquishes the lease, ownership of the minerals leased would revert back to the federal government, and the lease could be resold.

Well drilling on a lease would not be permitted until the lease owner or operator secures approval of a drilling permit and a surface use plan specified at 43 CFR 3162.

Drainage
LN-A: Parts of this lease may potentially be subject to drainage by wells located on adjacent private lands. The lessee shall, within 6 months of the drilling and completion of any productive well on the adjacent private lands, submit for approval by the authorized officer:

1. Plans for protecting the lease from drainage (43 CFR § 3162.2-3). The plan must include either (a) a completed Application for Permit to Drill for each of the necessary protective wells, or (b) a proposal for inclusion in a unitization or communitization agreement for the affected portion of the lease. Any agreement should provide for an appropriate share of the production from the offending well to be allocated to the lease; or
2. Engineering, geologic and economic data to demonstrate to the authorized officer's satisfaction that no drainage has occurred or is occurring and/or that a new protective well(s) would have little or no chance of production sufficient to yield a reasonable rate of return in excess of the costs of drilling, completing and operating the well.

If no plan, agreement, or data is submitted and drainage is determined to be occurring, compensatory royalty will be assessed. Compensatory royalty will be assessed on the first day following expiration of the 6-month period, and shall continue until a protective well has been drilled and placed into production status, or until the offending well ceases production, whichever occurs first. The lessee shall be obligated to pay compensatory royalty to the Office of Natural Resources Revenue (ONRR) at a rate to be determined by the BLM authorized officer.

Split Estate
LN-B: Portions of the surface estate of this lease are privately owned (i.e. split estate lands). While the Federal mineral lessee has the right to enter the property for necessary purposes related to lease development, the lessee is responsible for making arrangements, formalized in a Surface Use Agreement, with the surface owner prior to entry upon the lands. Lessee is hereby informed that the United States will not participate as a third party in negotiations between the lessee and the surface owner. Any agreement reached between the lessee and the surface owner(s) will not be binding on the United States.

Prior to submitting an Application for Permit to Drill (APD) for BLM's approval, lessee is required to submit the name, address, and phone number of the surface owner, if known, in its APD. The lessee must also make a good faith effort to provide a copy of their Surface Use Plan of Operations to the surface owner. After the APD is approved, the operator must make a good faith effort to provide a copy of the Conditions of Approval to the surface owner.

The lessee will be required to certify to the BLM in writing that: (1) It made a good faith effort to notify the surface owner before entry; and (2) That a Surface Use Agreement with the surface owner has been reached, or that a good faith effort to reach an agreement failed. If no agreement can be reached with the surface owner, the lessee must submit an adequate bond (minimum of $1,000) to the BLM, for the benefit of the surface owner, sufficient to pay for loss or damages. The surface owner has the right to appeal the sufficiency of the bond.

Once a parcel is leased, the lessee has the right to explore for and develop oil and gas resources, subject to standard lease terms and special stipulations pertaining to the conduct of operations. The conduct of operations by the lessee on all parcels would be subject to the following terms from the back of the standard lease form, which state:

"Conduct of Operations (SF-3100-11, Section 6)

> Lessee shall conduct operations in a manner that minimizes adverse impacts to the land, air, and water, to cultural, biological and other resources, and to uses or users. Lessee shall take reasonable measures deemed necessary by the lessor to accomplish the intent of this section. To the extent consistent with lease rights granted, such measures may include, but not limited to, modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures. Lessor reserves the right to continue existing uses and to authorize future uses upon or in leased lands, including the approval of easements or right-of-way. Such uses shall be conditioned so as to prevent unnecessary or unreasonable interference with rights of lessee.
>
> Prior to disturbing the surface of the leased lands, lessee shall contact lessor to be apprised of procedures to be followed and modifications or reclamation measures that may be necessary. Areas to be disturbed may require inventories or special studies to determine the extent of impacts to other resources. Lessee may be required to complete minor inventories or short-term special studies under guidelines provided by lessor. If in the conduct of operations, threatened or endangered species, objects of historic or scientific interest, or substantial unanticipated environmental effects are observed, lessee shall immediately contact lessor. Lessee shall cease any operations that would result in destruction of such species or objects."

3.0 Affected Environment and Environmental Consequences

3.1 Introduction

Direct and indirect impacts of the proposed actions will be discussed for BLM-administered and split estate lands. Cumulative impacts for other activities will be discussed for all ownerships in the cumulative impacts analysis area. Analyses will be based on the RFDS created for this document (Table 2, Section 3.1.2, and Appendix 1)

Impact Descriptors

Effects can be temporary (short-term) or long lasting/permanent (long-term). These terms may vary somewhat depending on the resource; therefore, each will be quantified by resource where applicable. Generally speaking:

- **Short-term**: 0-3 years (effects are changes to the environment during and following ground-disturbing activities that revert to pre-disturbance conditions, or nearly so, immediately to within a few years following the disturbance).
- **Long-term**: >3 years (effects are those that would remain beyond short-term ground disturbing activities).

The magnitude of potential effects is described as being major, moderate, minor, negligible, or no effect and is interpreted as follows:

- **Major** effects have the potential to cause substantial change or stress to an environmental resource or resource use. Effects generally would be long-term and/or extend over a wide area.
- **Moderate** effects are apparent and/or would be detectable by casual observers, ranging from insubstantial to substantial. Potential changes to or effects on the resource or resource use would generally be localized and short-term.
- **Minor** effects could be slight but detectable and/or would result in small but measurable changes to an environmental resource or resource use.
- **Negligible** effects have the potential to cause an indiscernible and insignificant change or stress to an environmental resource or use.
- **No effect =** no discernible effect.

3.1.1 General Discussion of Impacts

The act of leasing parcels, itself, does not affect resources. If the proposed parcels are leased, it remains unknown whether development would actually occur, and if so, where specific wells would be drilled and where facilities would be placed. This would not be determined until the BLM receives an application for permit to drill (APD) in which detailed information about proposed wells and facilities would be provided for particular leases. Therefore, this EA discusses potential effects that could occur in the event of development. The amount of development is based on potential well densities and associated activities described in a Reasonably Foreseeable Development Scenario (RFDS) developed for the proposed lease area (Section 3.1.2). As per NEPA regulations at 40 CFR 1502.14(f), 40 CFR 1502.16(h), and 40 CFR 1508.20, mitigation measures to reduce, avoid, or minimize potential impacts are identified by resource below.

Upon receipt of an APD, the BLM would initiate a site-specific NEPA analysis to more fully analyze and disclose site-specific effects of specifically identified activities. In all potential exploration and development scenarios, the BLM would require the use of best management practices (BMP) documented in "Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development" (USDI and USDA 2007), also known as the "Gold Book." The BLM could also identify APD Conditions of Approval (COA), based on site-specific analysis that could include moving the well location, restrict timing of the project, or require other reasonable measures to minimize adverse impacts (43 CFR 3101.1-2 Surface use rights; Lease Form 3100-11, Section 6) to protect sensitive resources, and to ensure compliance with laws, regulations, and land use plans.

3.1.2 Reasonably Foreseeable Development Scenario Summary and Assumptions

If the proposed area is leased, the RFDS describes four phases of exploration and development that could occur: exploration, drilling, field development and production, and abandonment (Appendix 1). The RFDS and EA use the following assumptions.

1. One well would be drilled per government section of approximately 640 acres (based on State well spacing order).
2. Federal lease wells would require an APD and subsequent site-specific NEPA analysis. Additional site-specific requirements, termed Conditions of Approval (COA), may be attached to the approved APD.
3. The total surface disturbance, including well pad, pipeline, and road construction, is assumed to be approximately 5 acres per well. After the well is drilled, the pad size and road widths would be minimized and unneeded acreage would be reclaimed.
4. The lessee would seek approval for a drilling permit from IDL for fee land wells.
5. Wells would be drilled using conventional drilling techniques (i.e., vertical holes that would not require hydraulic fracturing - based on recent drilling in the adjacent Willow and Hamilton fields and on the geologic characteristics of the reservoir).
6. Producing wells would be incorporated into the Willow Field unit development. Dry wells would be plugged and abandoned in accordance with State and federal requirements, and the site would be reclaimed.
7. Oil and gas leases would be issued for an initial term of 10 years, subject to extension if there is drilling occurring or if there is a producing well on the lease.
8. Where gas is present at more than one layer, dual completion would be identified, targeted, and permitted resulting in 1 well/640 acres.

The level of drilling and associated activities would depend on available lease parcels and the effect of stipulations. Between 2 and 25 wells could be drilled in the proposed lease area resulting in 7 to 87.5 acres of surface disturbance (Table 2). The Lessee on adjacent State and private leases is currently bonded for 11-30 wells and they have drilled eight. A total of 17 wells have been permitted and drilled, three within the proposed lease area (Map 1). Within the boundaries of the Hamilton and Willow (exclusive of the proposed lease area) fields, up to 53 new wells could be developed at 1 well/640 acres (Table 2).

Table 2. Acres of surface disturbance for new wells and associated infrastructure, Little Willow Creek lease area (Alternatives A-C) and potential wells in the Hamilton and Willow fields, Payette County, Idaho.

Activity	**Alternative**			**Field**[1]	
	A	**B**	**C**	**Hamilton**	**Willow**
New Wells (#)	2	22	25	47	6
Well Pad Disturbance (2.5 acres/pad)	5	55	62.5	117.5	15
New Roads (0.25 miles/well)	0.5	5.5	6.25	11.75	1.5
Road Disturbance (4 acres/mile)	2	22	25	47	6
Total Surface Disturbance (acres)	7	77	87.5	164.5	21

[1] Based on 1 well/640 acres for sections that do not currently have a well.

3.2 Soils

3.2.1 Affected Environment – Soils

Detailed soil surveys for Idaho have been published by the Natural Resources Conservation Service (NRCS). The proposed lease area is characterized by sloping lava plateaus with gently to moderately sloping alluvial fans (cone-shaped deposits of sediment crossed and built up by streams), terraces, and bottom lands. Soils in the lease area are mainly coarse sandy loams, sandy loams, and silt loams (USDA NRCS 2014). Soil erosion susceptibility indices (K-factors) are categorized into the following ranges: low (K ≤ 0.15), moderate (K = 0.16 - 0.40), and high (K ≥ 0.41). Erosion potential of these soils ranges from moderate (coarse sandy loams) to high (silt loams). K-factors range from 0.20 to 0.64.

The majority of soils are moderately susceptible to erosion (Table 3, Map 3). Approximately 79% of soils (784 acres) are moderately susceptible and 21% (213 acres) are highly susceptible to erosion in the BLM/BLM category; 65% of soils (3,495 acres) are moderately susceptible and 35% (1,899 acres) are highly susceptible in the Private/BLM category. In the Private/Private category 49% of soils are moderately susceptible to erosion and 51% are highly susceptible to erosion (Table 3).

Table 3. Acres of Ownership Categories (Surface/Subsurface Management) in Each K-factor Range.

K-factor Range	Management or Ownership Surface/Subsurface)[1]			Total
	BLM/BLM	Private/BLM	Private/Private	
Moderate (K = 0.16-0.40)	784 (79%)	3,495 (65%)	4,495 (49%)	8,774 (56%)
High (K ≥ 0.41)	213 (21%)	1,899 (35%)	4,758 (51%)	6,870 (44%)
Total Acres	997	5,394	9,253	15,644
K-factor ≤ 0.32	682 (68%)	3,031 (56%)	3,891 (42%)	7,604 (49%)
K-factor > 0.32	314 (32%)	2,364 (44%)	9,253 (58%)	8,040 (51%)
Total Acres	997	5,394	9,253	15,644

[1]BLM/BLM = BLM manages land surface and subsurface minerals; Private/BLM = BLM manages subsurface minerals (federal mineral estate); Private/Private = land surface and subsurface minerals privately owned.

Alternative C stipulations (Section 2.3) specific to Fragile Soils provide a lease notice (LN-1) indicating mitigation would be required in certain situations. In particular, soils with K-factors greater than 0.32 on slopes greater than 30% would require mitigation to limit erosion. Approximately 51% of the proposed lease area contains soils with K-factors above this threshold (Table 3, Figure 1).

3.2.2 Environmental Consequences – Soils

Impacts to soils are based on the RFDS created for this document (Table 2, Appendix 1).

3.2.2.1 General Discussion of Impacts

Soils are investigated to determine erosion hazard and reclamation suitability by evaluating slope and soil properties such as texture, organic matter content, structure, permeability, depth, available water capacity, and salt concentration. Site specific mitigation would limit but not eliminate impacts to soils in the proposed lease area. The extent of impacts to soils would depend on the amount and type of disturbance associated with particular activity, as well as the erosion risk of a given area. As slopes become steeper, the risk of soil instability increases. Actions that alter soil characteristics such as plant cover and composition (amount and species), soil structure, permeability, and compaction may increase erosion potential.

Figure 1. Typical topography, slope, and soil conditions of BLM land in the proposed lease area.

Direct impacts from exploration and development include mixing and breaking down soil components, compaction, and removal of soils in the short term (0-3 years) and long term (>3 years). Compaction alters soil structure (e.g., reduced porosity, increased bulk density) and, therefore, its functionality (e.g., its ability to support healthy vegetation communities and to properly cycle water and nutrients) over the long term (USDA and USFS 2006). Indirect impacts to soils would include removal of ground cover (e.g., vegetation, microbiotic crusts, and litter) in the short term, thus exposing soil surface to wind and water erosion and colonization by weedy, invasive, disturbance related vegetation (e.g., cheatgrass) and or noxious weeds (e.g., rush skeletonweed) over the long term. Reclamation would be required once wells and infrastructure are no longer in use; therefore, soil structure and function would improve from disturbance related levels over the long term.

Oil and gas exploration and development could increase the potential for fire ignitions due to sparks from heavy equipment and/or vehicles, particularly when soils and vegetation are dry. If a fire burns hot enough, it may impact soil directly by altering its physical properties. Physical properties of soils that are dependent on organic matter (e.g., soil structure, pore space, aggregation) could be affected by heating during a fire (USFS RMRS 2014). Fire could also impact soil hydrology (i.e., infiltration) by increasing water repellency (USFS RMRS 2014). However, fires generally move quickly through shrub and grass communities like those in the proposed lease area. Therefore, it is more likely that soils would be indirectly impacted by the loss of vegetative cover leaving them exposed to erosion, as well as alterations in vegetation which, in turn, could alter soil chemistry and overall productivity over the long term.

3.2.2.2 Alternative A

No BLM managed surface or subsurface/federal mineral estate parcels would be leased, so soils would not be directly impacted in these parcels. Oil and gas activities (wells, well pads, and road construction) on private surface/subsurface could disturb up to 7 acres of soils and remove up to 7 acres of vegetation per the RFDS. Moderate to major, direct and indirect, adverse impacts to soils (compaction, soil loss, loss of structure and function, and colonization by weedy plants) would occur over the short and long term on the 7 acres (<0.1% of the proposed lease area). Soils in the high range for erosion susceptibility would incur greater impacts than soils in the moderate range if disturbed (Table 3). Risk of fire starts would be low because there would be little oil and gas development (two wells plus infrastructure); therefore, fire related soil impacts would be minor. Overall impacts to soils would be negligible due to the very small disturbance footprint possible under this scenario.

3.2.2.3 Alternative B

The BLM would issue leases on 997 BLM surface acres and 5,352 acres of federal mineral estate; however, the NSO and NSSO stipulations would preclude any direct disturbance to soils in these parcels until the FRMP is completed. Impacts to soils, including potential fire related impacts, would be identical to Alternative A (i.e., up to 7 acres of moderate to major disturbance) until implementation of the FRMP.

The RFDS for this alternative indicates up to 22 wells and associated infrastructure would cause direct soil impacts on up to 77 acres (0.5% of the proposed lease area) including BLM surface and federal mineral estate, and private surface/subsurface lands. These soils could sustain moderate to major, adverse, direct impacts, such as compaction and removal, and indirect impacts, such as reduction in productivity, over the short and long term associated with well and well pad development and road building. Minor (e.g., limited vegetation disturbance and wildfires) to major (e.g., roads and activities increase disturbances and wildfires) indirect impacts could occur where vegetation shifts to exotic annual dominated communities (e.g., associated with roads or wildfires) occur and soil protection is reduced or eliminated. These areas would be more susceptible wind and water erosion over the long term. However, the extent (magnitude and scale) of impacts would depend on land use designations and stipulations set forth in the FRMP.

3.2.2.4 Alternative C

Impacts would be similar to those described in Alternative B (Section 3.2.2.3); however, per the RFDS, direct impacts on up to 88 acres (0.6% of the proposed lease area) could occur on BLM surface, federal mineral estate, and private lands. Indirect impacts would be more likely to affect federal mineral estate lands in this scenario because of the increased amount of disturbance and closer proximity of disturbances. Direct and indirect impacts associated with well and road construction could be reduced where fragile soils are avoided (LN-1, Section 2.3).

3.2.3 Mitigation

Prior to authorization, proposed actions (APDs) would be evaluated on a case-by-case basis and would be subject to mitigation measures in order to maintain the soil system. Where residual impacts are expected based on future site specific APD analyses, measures would be taken to reduce, avoid, or minimize potential impacts to soil resources from exploration and development activities. Examples of mitigation include avoiding excessively steep slopes and areas poorly suited to reclamation, limiting the total area of disturbance, rapid reclamation, erosion/sediment control, soil salvage, re-vegetation, weed control, slope stabilization, surface roughening, and protective fencing.

3.2.4 Cumulative Impacts – Soils

Cumulative impacts to soils are based on the RFDS created for this document (Appendix 1), the Willow Field RFDS, and the actions identified below.

3.2.4.1 Scope of Analysis

The cumulative impact analysis area (CIAA) includes the proposed lease area and the Willow Field southwest of the lease area plus a 0.5-mile buffer totaling approximately 32,460 acres (50 square miles) (Map 3). The CIAA contains private, State, and BLM surface and federal mineral estate lands. This area was selected because the lands it encompasses have similar topographic, geologic, and soil attributes; soil condition (due to land use and wildfire) and susceptibility to erosion (K-factors) are also similar.

3.2.4.2 Current Conditions, Effects of Past and Present Actions, and Reasonably Foreseeable Future Actions

Soil conditions in the CIAA are nearly identical to those in the proposed leased area; the proposed lease area makes up the majority of the CIAA and the Willow Field has undergone similar disturbances. The levels and intensities of anthropogenic activities across all land jurisdictions in the CIAA has perpetuated increases of early successional, highly disturbed landscapes (Leu and Hanser 2011) that are at higher risk for cumulative soil impacts. Past, ongoing, and future land uses contributing to soil conditions include livestock grazing, agricultural development, rights-of-way, and oil and gas development. Wildfire, though not a land use, has also influenced soil conditions.

Livestock Grazing - Both BLM and private lands within CIAA, the proposed lease area in particular, encompass portions of the Sand Hollow, Rock Quarry Gulch, Dahnke, Hashegan, and Kaufman grazing allotments. Livestock grazing can damage soils via compaction, disruption of the soil profile, and remove vegetative cover exposing soils to erosion, particularly where livestock tend to congregate. Historic and recent grazing management in these allotments have contributed to overall soil condition. Livestock grazing would continue at current levels into the foreseeable future.

Agricultural Development - Conversion from shrub and grass communities to cultivated croplands on private land has altered soils on approximately 28% (8,962 acres) of the CIAA. Future agricultural development is unlikely (or would be negligible) because water necessary for crop production is limited.

Rights-of-way (power lines, roads) - Three short power line segments totaling approximately one mile are present in the CIAA. Power lines typically have two-track roads associated with them which disturb and impact soils. Approximately 9 miles of developed roads including the Little Willow Road (7.8 miles) and Big Willow Road (1.2 miles) run through the CIAA. These features combined have a disturbance footprint of approximately 40 acres; which, to a small degree, have contributed to present soil conditions across the CIAA. Future roads would be constructed in association with development of wells, well pads, and other infrastructure or facilities necessary to maintain oil and gas production. Road construction and maintenance would continue to affect soil erosion and displacement within maintained buffers. These effects are spatially restricted and occur over a continuous temporal scale.

Oil and Gas Development - Currently there are 11 wells and 1 well surface site in the CIAA. An estimated 30-41 acres (depending on infrastructure) of soils have been disturbed in the CIAA to date due to oil and gas exploration and development. An additional 6 wells could be drilled in the Willow Field portion of the CIAA in the future disturbing 21 acres of soils.

Wildfire - Approximately 16,655 acres (51 %) of the CIAA has burned at least one time. Multiple fires have burned within the CIAA, mainly in the 1980s, with some overlap. These fires have perpetuated increases of disturbance related plants, which are indicative of decreased soil productivity.

3.2.4.3 Alternative A – Cumulative Impacts

Disturbance from two wells and related infrastructure (7-acre footprint) would produce negligible short and long term impacts to soils when combined with ongoing and future land uses and disturbance. An additional 6 wells in the Willow Field portion of the CIAA would disturb soils on approximately 21 acres (<0.1% of the CIAA). Livestock grazing, rights-of-way construction and maintenance, and Willow Field oil and gas development combined would produce overall minor to moderate soil impacts over the short and long term. No or negligible additional impacts would occur from development of agriculture due limited water availability necessary for these actions. Wildfires could produce minor to major direct and indirect impacts to soils depending on their size and frequency.

3.2.4.4 Alternatives B and C– Cumulative Impacts

Development of 22 to 25 wells (77-87.5-acre footprint) and related infrastructure would produce minor short and long term impacts to soils in the CIAA when combined with ongoing and future land uses and disturbance. Cumulative impacts to soils from ongoing and future actions including livestock grazing, agricultural development, roads and ROWs, oil and gas development, and wildfire would be identical to those described for Alternative A.

3.3 Vegetation

3.3.1 Affected Environment – Vegetation

General Vegetation

Two ecological sites comprise the majority of the proposed lease area. South Slope Granitic 8-12 is associated with coarse sandy loams and is the primary ecological site occurring on steeper slopes and upper portions of gentle slopes. Loamy 8-12 is associated with sandy loams and silt loams which are present in the bottoms, on toe slopes, and lower portions of steeper slopes.

Basin big sagebrush and bluebunch wheatgrass vegetation communities are characteristic of South Slope Granitic 8-12 sites, and Wyoming big sagebrush and bluebunch wheatgrass with Thurber's needlegrass are characteristic of Loamy 8-12 sites. However, based on 2014 site visits, current plant communities on BLM-administered lands are largely dominated by cheatgrass, an invasive annual grass, and introduced annual forbs (e.g., tall tumblemustard, tansymustard, and clasping pepperweed); which is a result of frequent wildfires in the 1980s and recurring spring livestock grazing (Map 4). Between 1980 and 1986, approximately 49% of the area burned once, 15% burned twice, and 3% burned three times. Perennial plant species occasionally present include Sandberg bluegrass, crested wheatgrass, rabbitbrush, and small pockets of remnant bitterbrush, stiff sagebrush, and Wyoming big sagebrush. In general, north-facing slopes are wetter and contain slightly more perennial vegetation than south-facing, drier slopes; therefore, northerly slopes tend to be more resistant to disturbance and support more resilient plant communities.

General vegetation cover types mapped for the proposed lease area are consistent with observations made during site visits (
Table 4). Exotic Annuals (i.e., cheatgrass and introduced annual mustards) is the dominant cover type for all ownership configurations (Figure 2). Big Sagebrush (mainly Wyoming big sagebrush and/or basin big sagebrush with cheatgrass and Sandberg bluegrass) is the second most common cover type followed by Bunchgrass (mainly Sandberg bluegrass with cheatgrass and occasionally shrubs) and Stiff Sagebrush (mainly stiff sagebrush with cheatgrass, Sandberg bluegrass, and introduced forbs) on BLM/BLM and Private/BLM. On Private/Private, agriculture is the second most common cover type followed by Big Sagebrush. All remaining cover types comprise 4% each or less for all ownership configurations.

Table 4. Acres of general vegetation cover types[1] and percent composition by mineral ownership, Little Willow Creek proposed lease area, Payette County, Idaho.

General Cover Type	**Ownership (Surface/Subsurface)[2]**			**Total Acres**
	BLM/BLM	**Private/BLM**	**Private/Private**	
Agriculture	3.3 (<1%)	145.6 (3%)	3,004.6 (33%)	3,153.5 (20%)
Big Sagebrush[3]	258.4 (26%)	1,216.3 (23%)	1,478.6 (16%)	2,953.3 (19%)
Bitterbrush	6.6 (<1%)	15.6 (<1%)	15.8 (<1%)	38.0 (<1%)
Bunchgrass	112.5 (11%)	434.2 (8%)	336.2 (4%)	883.0 (6%)
Exotic Annuals	460.4 (46%)	3,125.0 (59%)	3,756.8 (41%)	7,342.2 (47%)
Greasewood	29.8 (3%)	63.1 (1%)	95.6 (1%)	188.5 (1%)
Salt Desert Shrub	28.2 (3%)	155.3 (3%)	112.9 (1%)	296.4 (2%)
Stiff Sagebrush	91.4 (9%)	162.0 (3%)	346.5 (4%)	599.9 (4%)
Wet Meadow	1.1 (<1%)	3.5 (<1%)	29.0 (<1%)	34.0 (<1%)
Other[4]	3.1 (<1%)	13.9 (<1%)	30.1 (<1%)	47.1 (<1%)
Total Acres[5]	995	5,335	9,206	15,536

[1] Pacific Northwest National Laboratory vegetation mapping data (2002).

[2] BLM/BLM = BLM manages land surface and subsurface minerals; Private/BLM = BLM manages subsurface minerals (federal mineral estate); Private/Private = land surface and subsurface minerals privately owned.
[3] Big Sagebrush Mix and Big Sagebrush were combined because the two have nearly identical components.
[4] Other includes Mountain Big Sagebrush, Mountain Shrubs, Rabbitbrush, Sparse Vegetation, Urban, and Water; which were combined because they represent a small portion (<15 acres in each ownership category) of the proposed lease area.
[5] Total acres are slightly less than 15,644 due to GIS processing of PNNL data set (raster data vs. vector data).

Figure 2. Typical vegetation on BLM surface and mineral estate land in the proposed lease area. Note tall tumble mustard, cheatgrass, and Sandberg bluegrass in the foreground and a patch of green rabbitbrush in the background.

Riparian Vegetation

There are 39 acres (<1% of the total lease acres) in the Wet Meadow cover type, which is indicative of riparian vegetation (e.g., cottonwoods, willows, rushes, and sedges) (
Table 4). The vast majority of the Wet Meadow cover type (35 acres) is on private lands with private subsurface; only 1.1 acres are on BLM surface managed lands (BLM/BLM) and 3.5 acres are on federal mineral estate (Private/BLM). These areas are mainly associated with Little Willow Creek and the McIntyre Canal and are primarily on private land with private subsurface (Map 5). Additionally, National Wetland Inventory mapping shows approximately 56 acres (which overlap the Wet Meadow cover type to a small degree) of water features (e.g., emergent wetlands, ponds, seeps, and reservoirs) (Map 6). These features are typically used as livestock water sources and are generally sparsely vegetated as a result.

Special Status Plants (SSP)

Two sensitive plant species are mapped in the proposed lease area, an element occurrence (EO) of Snake River goldenweed (BLM Type 3 SSP) and an historical EO of calcareous buckwheat (BLM Type 3 SSP). Three additional EOs of Snake River goldenweed and one EO of Aase's onion (BLM Type 2 SSP) are present within 1 mile of the proposed lease area (Map 5). The calcareous buckwheat was last observed in 1933 and may no longer exist; further, the mapping precision for this EO is very low (G precision)[C], so it is possible that the EO is actually outside the proposed lease area.

Three of the Snake River goldenweed EOs (which includes the EO in the proposed lease area) were not given condition ranks. However, EO records from 2000 indicated that these EOs occurred in dry grasslands-annual grasslands with some perennial species-within weedy rangeland with occasional fire disturbance. Based on the degradation of the vegetation communities across the proposed lease area, and that these EOs are largely mapped in the annual grass cover type, population viability is likely poor. The fourth EO was given a condition rank of D signifying poor estimated viability; the 2006 EO report indicated that the area had burned multiple times and was dominated by annual weeds with few remaining shrubs, and population numbers were drastically lower than previous years. The Aase's onion EO was ranked B for condition in 1995 indicating good estimated viability; however, the EO report states the area had burned, shrubs had not re-established, and cheatgrass was common.

Noxious Weeds

'Noxious' is a legal designation given by the Director of the Idaho State Department of Agriculture to any plant having the potential to cause injury to public health, crops, livestock, land or other property (Idaho Statute 22-2402). The Boise District BLM has an active weed control program that annually updates the locations of noxious weeds and treats known weed infestations utilizing chemical, mechanical, and biological control techniques. Infestations of noxious weeds are treated contingent upon the BLM annual weed budget, employee availability, and noxious weed priority.

There are no noxious weeds mapped in the proposed lease area according to BLM Boise District noxious weeds database. However, numerous infestations of rush skeletonweed and Scotch thistle have been recorded in the vicinity (within three to five miles). Many of these infestations have been chemically treated at least once since 2001. Although no noxious species have been recorded within the proposed lease area boundary, it is likely that they do occur to some degree based on the degraded state of vegetation communities.

3.3.2 Environmental Consequences – Vegetation

Impacts to vegetation are based on the RFDS created for this document (Table 2, Appendix 1).

[C] G is the lowest precision and is typically applied by the Idaho Fish and Game's Idaho Natural Heritage program to historic observations and or observations lacking GPS data. A large buffer is created around a centroid, indicating that the location of the EO likely occurs/occurred somewhere within the polygon, but confidence is low as to its precise location. This EO is not depicted on the map provided because the location polygon is so large (77miles^2).

3.3.2.1 General Discussion of Impacts

Site specific mitigation and stipulations would limit impacts to sensitive vegetation (SSPs) and sensitive areas (riparian areas). The level of impacts to vegetation would depend on the amount and type of disturbance associated with a given activity.

General Vegetation

Lease development would directly impact vegetation by removing, damaging (i.e., breakage, trampling), or burying plants. When vegetation is removed and soil is exposed, noxious and invasive species may spread degrading overall condition of plant communities. The influx of machinery and vehicle travel associated with development, production, and improved access would increase the risk of fire starts, especially once vegetation has cured (late summer). Fire would damage or remove vegetation and potentially further degrade vegetation community structure and function. Burned areas would be more susceptible to noxious and invasive species colonization/spread and overall habitat degradation. Roads and degraded habitats would increase fragmentation by reducing the size of and increasing the distance between native vegetation stands.

Surface disturbing activities could also indirectly affect vegetation by disrupting seed banks and mixing, eroding, or compacting soils. Soil erosion would reduce the substrate available for plants and soil compaction could limit seed germination. Fugitive dust generated by construction activities and travel along dirt roads could affect nearby plants by depressing photosynthesis, disrupting pollination, and reducing reproductive success. Impacts to plants occurring after germination but prior to seed set could be particularly harmful as both current and future generations would be affected.

Riparian Vegetation

Direct and indirect impacts to riparian vegetation by surface disturbing activities would be the same as those described for general vegetation. However, mitigation and stipulations would likely prevent direct impacts to riparian vegetation, except on private lands with private mineral estate.

Special Status Plants

Direct impacts by surface disturbing activities would be the same as those described for general vegetation; however, mitigation and stipulations could prevent direct impacts. Networks of oil and gas infrastructure, roads in particular, could create pollinator and seed dispersal barriers. Vegetation removal and displacement by invasive and/or noxious species would also cause indirect impacts to sensitive plants via habitat degradation. Habitat fragmentation could also lead to a decrease in pollinators over time. All of these factors could decrease long-term EO viability.

Noxious Weeds

Both rush skeletonweed and Scotch thistle are capable of invading and dominating disturbed areas (roadsides, areas burned by wildfire, etc.) over a wide range of precipitation regimes and habitats (Sheley and Petroff 1999). Road building and use would create corridors and seed sources for noxious weed establishment and spread. Noxious weed inventories and treatments could offset some impacts.

3.3.2.2 Alternative A

General Vegetation

Development and production on private surface with private subsurface could disturb up to 7 acres (<0.1% of the proposed lease area) of vegetation. Moderate to major, direct (i.e., removal, breakage, and burying of vegetation) and indirect (e.g., influx of noxious and invasive species, disruption of seed bank, and plant community degradation) impacts would occur over the short (0-3 years) and long (>3 years) term in the isolated areas associated with wells and roads. The federal mineral estate (6,349 acres) would not be leased, so vegetation would not be directly affected in these parcels.

Vegetation in the unleased area could receive similar negligible to minor indirect impacts where invasive annuals, noxious weeds, or fires spread from developed areas. The degree of indirect impacts would depend on the condition and components of plant communities prior to disturbance. Those plant communities maintaining shrubs and native perennial grasses could better resist invasive and noxious weed invasions; however, they would be less resistant if affected by fire. New and upgraded roads would cause minor increased fragmentation.

The threat of fire ignitions could increase a minor amount by equipment use and vehicles travelling on existing and new (0.5 miles) access roads. The extent of impacts to vegetation across all jurisdictions would be influenced by fire size and behavior, as well as the pre-fire vegetation community conditions.

Riparian Vegetation

There would be no impacts to riparian vegetation or habitat on BLM-administered land or federal mineral estate. The extent of short- and long- term direct impacts (i.e., removal or damage) and long-term indirect impacts (i.e., habitat degradation) to riparian vegetation on private mineral estate would depend on the proximity of the disturbance. Any impacts would likely come from access roads associated with wells/well pads.

Special Status Plants

The Snake River goldenweed EO, or other currently mapped special status plant EOs, would not be directly impacted (i.e., removed or damaged). Long-term indirect impacts, such as habitat degradation or fragmentation, would be negligible because overall habitat condition is already relatively poor and the 0.5 mile of new access roads would be ≥2.5 miles away.

Noxious Weeds

The 0.5 miles of new roads could serve as minor noxious and invasive species corridors over the long term.

3.3.2.3 Alternative B

General Vegetation

The NSO and NSSO stipulations would apply until the FRMP is finalized and implemented; therefore, until that time, direct impacts to vegetation would be similar to those described for Alternative A (Section 3.3.2.2).

The RFDS for this alternative specifies up to 77 acres (0.5% of the proposed lease area) of vegetation on private surface and subsurface would sustain moderate to major, adverse, direct impacts (i.e., removal, breakage, and burying of vegetation). Minor to major indirect impacts (e.g., influx of noxious and invasive species, disruption of seed bank, and plant community degradation) could occur over the long term. Because wells and roads would occur throughout the proposed lease area, both private and federal mineral estate lands could be adversely affected. Moderate increases in habitat fragmentation could occur, especially where invasive species increase adjacent to roads. Minor (access restricted by private landowners and fire starts remain similar to current levels) to major (access not restricted and fire starts increase substantially) wildfire impacts could degrade vegetation conditions increasing fragmentation over the long term. However, the extent (magnitude and scale) of impacts to vegetation would depend on land use designations and stipulations set forth in the FRMP.

Riparian Vegetation

Direct impacts (i.e., removal or damage) to riparian areas would not occur on federal mineral estate lands. Long-term indirect impacts on BLM surface and federal mineral estate riparian vegetation would be similar to Alternative A (Section 3.3.2.2) and depend on the proximity of the disturbance. The extent of indirect impacts could be greater than Alternative A because more development would require more access roads (0.5 versus 5.5 miles of new access roads).

Special Status Plants

No direct impacts to the Snake River goldenweed EO or other currently mapped special status plant EOs would occur. Long-term indirect impacts to SSPs on BLM surface and federal mineral estate could be minor to moderate, but would depend on the proximity of the disturbance. However, the degree of these impacts could be greater than Alternative A because development could occur within 0.2 miles of the EO. Increased fragmentation and wildfire potential would adversely affect the EO over the long term.

Noxious Weeds

The 5.5 miles of new roads (and upgrades of existing roads) accessing 22 wells would serve as minor to moderate noxious and invasive species corridors over the long term.

3.3.2.4 Alternative C

General Vegetation

The same area would be leased as Alternative B, but Cascade RMP stipulations and other lease notices for development would apply specific to riparian areas and SSPs. According to the RFDS, up to 87.5 acres (0.6% of the proposed lease area) would sustain moderate to major, adverse, direct impacts (i.e., removal, breakage, and burying of vegetation). Vegetation community degradation, increased invasive species, seed bank disruption, and wildfire impacts would be similar to those described in Alternative B (Section 3.3.2.3); however, federal mineral reserve lands (with minor exceptions associated with avoidance buffers) would be more likely to be affected because direct disturbances would occur on rather than adjacent to these lands.

Riparian Vegetation

Negligible indirect impacts could occur over the short and long term. Stipulations CSU-1 and CSU-2 (Section 2.3) would preclude direct impacts and limit indirect impacts.

Special Status Plants

Impacts (habitat degradation and fragmentation) would be similar to those described for Alternative B (Section 3.3.2.3); however, development could occur closer to EOs producing greater indirect impacts.

Noxious Weeds

The 6.25 miles of new access roads associated with 25 wells would increase the threat of noxious and invasive species spread slightly more than Alternative B (Section 3.3.2.3), but would remain in the minor to moderate range, overall. There are no stipulations or mitigation specific to noxious weeds under this scenario, but the Boise District BLM's annual weed control program could help mitigate noxious weed expansion.

3.3.3 Mitigation

Site specific mitigation would be addressed at the APD stage of exploration and development. If necessary, COAs could be applied including re-vegetation strategies using native and/or desirable non-native plant species, soil enhancement practices, modification of livestock grazing, and fencing of reclaimed areas. Noxious weed inventories and treatments may also be required.

Special Status Plants

Section 7 of the Endangered Species Act (ESA) requires BLM land managers to ensure that any action authorized, funded, or carried out by the BLM is not likely to jeopardize the continued existence of any threatened or endangered species and that it avoids any appreciable reduction in the likelihood of recovery of affected species. Consultation with the U. S. Fish and Wildlife Service (FWS) is required on any action proposed by the BLM or another federal agency that affects a listed species or that jeopardizes or modifies critical habitat.

The BLM's Special Status Species Policy outlined in BLM Manual 6840, Special Status Species Management, is to conserve listed species and the ecosystems on which they depend and to ensure that actions authorized or carried out by BLM are consistent with the conservation needs of special status species and do not contribute to the need to list any of these species. The BLM's policy is intended to ensure the survival of those plants that are rare or uncommon, either because they are restricted to specific uncommon habitat or because they may be in jeopardy due to human or other actions. The policy for federal candidate species and BLM sensitive species is to ensure that no action that requires federal approval should contribute to the need to list a species as threatened or endangered.

Prior to any exploration or development, the BLM would conduct site specific rare and sensitive plant surveys. If rare (threatened, endangered, proposed, or candidate species) or sensitive plants

(SSPs) are found, avoidance stipulations (e.g., disturbance buffers) would be applied. If listed species are found, BLM would consult with the USFWS during the analysis phase of processing an ADP.

3.3.4 Cumulative Impacts – Vegetation

Cumulative impacts to vegetation are based on the RFDS created for this document (Appendix 1), the Willow Field RFDS, and the actions described below.

3.3.4.1 Scope of Analysis

The CIAA for vegetation, consistent with the soils CIAA, encompasses the proposed lease area and the Willow field totaling plus a 0.5-mile buffer totaling approximately 32,460 acres (50 miles^2) (Map 4). This area was selected because it contains similar ecological sites and plant community components, conditions are similar, and oils and gas leasing and development is occurring (land uses are comparable).

3.3.4.2 Current Conditions, Effects of Past and Present Actions, and Reasonably Foreseeable Future Actions

Conditions across the CIAA are similar to conditions in the proposed lease sale perimeter: vegetation communities have been degraded and are largely dominated by non-native, weedy, annual species with small patches of remnant native shrubs and perennial grasses. There are no additional special status plants or noxious weeds mapped within the CIAA. Past, ongoing, and future land uses contributing to condition of vegetation include livestock grazing, agricultural development, rights-of-way, and oil and gas development. Wildfire has also been instrumental in shaping the vegetation community components and overall condition.

Livestock Grazing - Both BLM and private lands within CIAA, the proposed lease area in particular, encompass portions of the Sand Hollow, Rock Quarry Gulch, Dahnke, Hashegan, and Kaufman grazing allotments. Livestock grazing can damage and remove vegetation, especially where livestock tend to congregate. Historic and recent grazing management in these allotments have contributed to overall plant community condition. Livestock grazing would continue at current levels into the foreseeable future.

Agricultural Development - Conversion from shrub and grass communities to cultivated croplands on private land has occurred on approximately 28% (8,962 acres) of the CIAA. Future agricultural development is unlikely (or would be negligible) because water necessary for crop production is limited.

Roads and Rights-of-way (ROW) - Road or ROW (powerlines and pipelines) construction and subsequent ongoing maintenance (e.g., blading, grading, and/or spraying) along these features will continue to affect vegetation within and adjacent to maintained buffers. Blading and grading disturb soils and vegetation and often create conditions conducive to noxious and invasive species establishment. Spraying of these sites helps to keep weeds and weedy species relatively restricted to the maintained buffers or to a minimum (e.g., around powerline poles, which are kept relatively free of vegetation to prevent fire). As a result, upland vegetation is often sparse in these locations. Road construction and maintenance would continue to impact vegetation within maintained buffers. These effects are generally spatially restricted and occur over a continuous temporal scale.

Three short power line segments totaling approximately one mile are present in the CIAA. Power lines typically have two-track roads associated with them which disturb and impact vegetation. Approximately 9 miles of developed roads including the Little Willow Road (7.8 miles) and Big Willow Road (1.2 miles) run through the CIAA. Combined, these features have a disturbance footprint of approximately 40 acres; which has contributed to present plant community conditions. Additional roads are anticipated to access wells, well pads, and other infrastructure or facilities necessary to maintain oil and gas production.

Oil and Gas Development - Currently there are 11 wells and 1 well surface site in the CIAA. Vegetation on approximately 30-41 acres (depending on infrastructure) has been removed or disturbed to date due to oil and gas exploration and development. An additional 6 wells could be drilled in the Willow Field portion of the CIAA which would disturb approximately 21 acres of vegetation.

Wildfire - Several fires have burned across the CIAA, mainly in the 1980s. Approximately 51 % (16,655 acres) of the CIAA has burned at least one time. These fires have perpetuated increases of disturbance related plants, degrading overall vegetation community conditions. Disturbance related vegetation often equates to fine fuels which burn readily creating a negative feedback loop.

3.3.4.3 Alternative A – Cumulative Impacts

Disturbance from two wells and related infrastructure would produce negligible additive short- and long-term impacts to vegetation. In the Willow Field portion of the CIAA, an additional 6 wells would disturb vegetation on approximately 21 acres (<0.1% of the CIAA) combined with the 30-41 acres of existing disturbance would produce minor impacts over the short and long term. Ongoing livestock use in areas grazed each spring (before seed set) could perpetuate disturbance related plants. Sensitive plants could also be impacted directly via trampling by livestock. Rights-of-way construction and maintenance would produce overall minor impacts to vegetation including habitat degradation and fragmentation over the short and long term. Wildfires could produce minor to major direct and indirect impacts to vegetation depending on fire size and frequency. Further agricultural development is improbable, so no additional impacts to vegetation would take place.

3.3.4.4 Alternatives B and C – Cumulative Impacts

Development of 22 to 25 wells and related infrastructure totaling 77 to 87.5 acres of disturbance would produce minor short and long term additive impacts to vegetation in the CIAA. Cumulative impacts to vegetation from ongoing and future actions identified in section 3.3.3.2 (livestock grazing, agricultural development, roads and ROWs, oil and gas development, and wildfires) would be identical to those described for Alternative A.

3.4 Air Resources

Air resources include air quality, air quality related values (AQRVs), and climate change. As part of the planning and decision making process, the BLM considers and analyzes the potential effects of BLM and BLM-authorized activities on pollutant emissions and on air resources.

The Environmental Protection Agency (EPA) has the primary responsibility for regulating air quality, including seven criteria air pollutants subject to National Ambient Air Quality Standards (NAAQS). Pollutants regulated under NAAQS include carbon monoxide (CO), lead, nitrogen dioxide (NO2), ozone, particulate matter with a diameter less than or equal to 10 microns (PM10), particulate matter with a diameter less than or equal to 2.5 microns (PM2.5), and sulfur dioxide (SO2). Two additional pollutants, nitrogen oxides (NOx) and volatile organic compounds (VOCs) are regulated because they form ozone in the atmosphere. Air quality regulation is also delegated to the IDEQ. Air quality is determined by pollutant emissions and emission characteristics, atmospheric chemistry, dispersion meteorology, and terrain. The AQRVs include effects on soil and water such as sulfur and nitrogen deposition and lake acidification, and aesthetic effects such as visibility.

Climate is the composite of generally prevailing weather conditions of a particular region throughout the year, averaged over a series of years. Climate change includes both historic and predicted climate shifts that are beyond normal weather variations.

3.4.1 Affected Environment – Air Resources

Air Quality

Based on data from monitors located in Baker County Oregon (west and generally upwind of the lease area) and Ada and Canyon counties (southeast and generally downwind of the lease area), air quality in Payette County is believed to be much better than required by the NAAQS. The EPA air quality index (AQI) is an index used for reporting daily air quality (http://www.epa.gov/airdata/) to the public. The index tells how clean or polluted an area's air is and whether associated health effects might be a concern. The EPA calculates the AQI for five criteria air pollutants regulated by the Clean Air Act (CAA): ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established NAAQS to protect public health. An AQI value of 100 generally corresponds to the primary NAAQS for the pollutant. The following terms help interpret the AQI information:

- **Good** – The AQI value is between 0 and 50. Air quality is considered satisfactory and air pollution poses little or no risk.
- **Moderate** – The AQI is between 51 and 100. Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people. For example, people who are unusually sensitive to ozone may experience respiratory symptoms.
- **Unhealthy for Sensitive Groups** – When AQI values are between 101 and 150, members of "sensitive groups" may experience health effects. These groups are likely to be affected at lower levels than the general public. For example, people with lung disease are at greater risk from exposure to ozone, while people with either lung disease or heart disease

are at greater risk from exposure to particle pollution. The general public is not likely to be affected when the AQI is in this range.

- **Unhealthy** – The AQI is between 151 and 200. Everyone may begin to experience some adverse health effects, and members of the sensitive groups may experience more serious effects.
- **Very Unhealthy** – The AQI is between 201 and 300. This index level would trigger a health alert signifying that everyone may experience more serious health effects.

AQI data show that there is little risk to the general public from air quality in the analysis area (Table 5). Based on available aggregate data for Baker, Ada, and Canyon counties (the nearest counties with monitoring data) for years 2011–2013, more than 84% of the days were rated "good" and the three-year median daily AQI was 19 to 32. Moderate or lower air quality days were typically associated with winter inversions or summer wildfire activity.

Table 5. Air Quality Index Report – Analysis Area Summary (2011-2013), Baker County Oregon and Ada Canyon Counties Idaho.

County[1]	# Days in Period	Median AQI	# Days rated Good	Percent of Days Rated Good	# Days Rated Moderate	# Days Rated Unhealthy for Sensitive Groups	# Days Rated Unhealthy	# Days Rated Very Unhealthy
Baker	1,084	28	915	84	167	2	0	0
Ada	1,088	32	917	84	157	11	2	1
Canyon	1,019	19	925	91	87	4	3	0

Source: EPA 2013a.

Emissions in Payette County are low, due to a small populations and little industrial activity. Based on 2011 emission inventory data available from the EPA National Emission Inventory, oxides of nitrogen, carbon monoxide, $\leq$10 micron particulate matter (PM_{10}), volatile organic compounds, and carbon dioxide were the most common non-biogenic emissions in Payette County (EPA 2014a). As described above, these emissions occur in an area with good air quality.

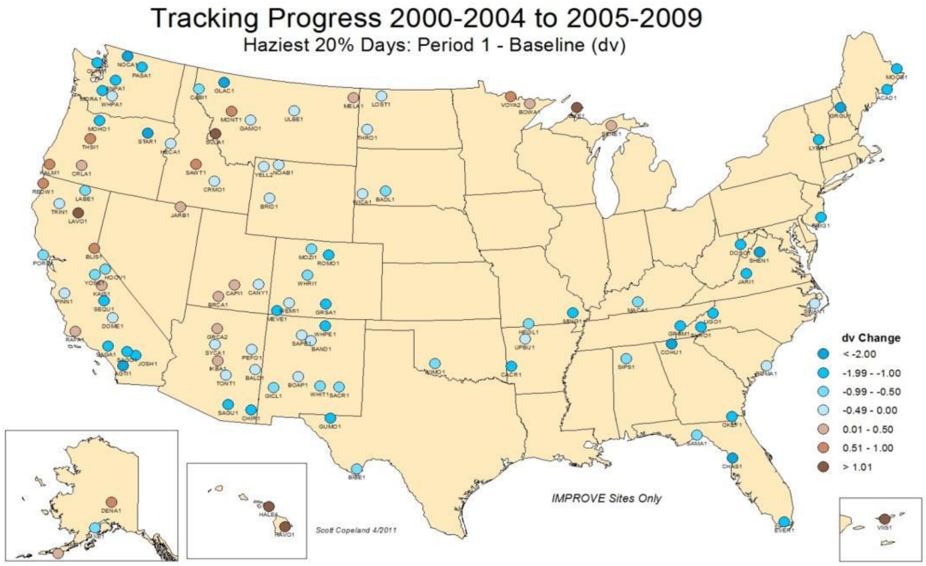
Table 6. Annual emissions (tons/year) of typical pollutants, typical annual emissions for a well (Upper Green River, Wyoming), and emissions for the reasonably foreseeable development scenario wells (Payette County) and cumulative impacts analysis area (Baker, Ada, Canyon, and Payette counties), Idaho and Oregon.

Pollutant	**Payette County**	**Cumulative Impacts Analysis Area**	**Per Well[1]**	**Alternative (%increase over Payette County values)**			**Hamilton and Willow Fields[(2)]**
				A	**B**	**C**	
NOx (Oxides of Nitrogen)	1,445.4	24,851.4	14.6	29.2 (2%)	321.2 (22.2%)	365 (25.3%)	774 (3.1%)
CO (Carbon Monoxide)	6,308.3	149,894.3	3.9	7.8 (0.1%)	85.8 (1.4%)	97.5 (1.6%)	207 (0.1%)
SO_2 (Sulfur Dioxide)	39.1	2,800.2	0.0004	0.0008 (<0.01%)	0.0088 (0.02%)	0.01 (0.03%)	0.02 (0.001%)
PM_{10} (Particulates	6,195.6	61,101.9	6.7	13.4	147.4	167.5	355.1

Pollutant	Payette County	Cumulative Impacts Analysis Area	Per Well[1]	Alternative (%increase over Payette County values)			Hamilton and Willow Fields[(2)]
				A	B	C	
with diameters ≤10 microns or ≤10 x 10^{-6} meters)				(0.2%)	(2.4%)	(2.7%)	(0.7%)
$PM_{2.5}$ (Particulates with diameters ≤ 2.5 microns or ≤2.5 x 10^{-6} meters)	828.4	12,815.4	0.8	1.6 (0.2%)	17.6 (2.1%)	20.0 (2.4%)	42.4 (0.3%)
VOCs (Volatile Organic Compounds)	1,123.1	28,539.1	5.2	10.4 (0.9%)	114.4 (10.2%)	130.0 (11.6%)	275.6 (1.0%)
HAPs (Hazardous Air Pollutants)							
Benzene	18.2	583.2	0.12	0.2 (1.3%)	2.6 (14.5%)	3.0 (16.5%)	6.4 (1.2%)
Toulene	67.4	1,509.5	0.22	0.4 (0.7%)	4.8 (7.2%)	5.5 (8.2%)	11.7 (0.8%)
Ethylbenezene	9.7	190.3	0.00003	0.00006 (<0.01%)	0.0007 (0.01%)	0.0008 (0.01%)	0.002 (0.001%)
Xylene	39	801.5	0.17	0.3 (0.9%)	3.7 (9.5%)	4.3 (10.9%)	9.0 (1.1%)
n-Hexane	23	615.1	0.20	0.4 (1.7%)	4.4 (19.1%)	5.0 (21.7%)	10.6 (1.7%)
Total HAPs	157.3	3,654.6	0.72	1.4 (0.9%)	15.8 (10.2%)	18.0 (11.4%)	38.2 (1.0%)
GHGs (Greenhouse Gases)							
CO_2 (Carbon Dioxide)	240,158	4,029,296	2,582.1	5,164.2 (2.2%)	56,806.2 (23.7%)	64,552.5 (26.9%)	136,851.3 (3.4%)
CH_4 (Methane)	28.6	1,478.8	14.1	28.2 (98.6%)	310.2 (1,085%)	352.5 (1,233%)	747.3 (50.5%)
N_xO (Nitrous Oxides)	8.4	169.0	0.05	0.1 (1.2%)	1.1 (13.1%)	1.3 (14.9%)	2.7 (1.6%)
CO_2 eq (Global Warming Potential)[3]	243,362	4,112,744	2,893.7	5,787.4 (2.4%)	63,661.4 (26.2%)	72,342.5 (29.7%)	153,366.1 (3.7%)

[1] Source: Kleinfelder (2014)
[2] %increase over CIAA
[3] GWP (Global Warming Potential/Carbon Dioxide Equivalent [CO_2eq]) for CO_2 =1, CH_4 = 21, and N_2O = 310.

Air resources also include visibility, which can be degraded by regional haze caused in part by sulfur, nitrogen, and particulate emissions. Based on trends identified during 2000-2009, visibility has improved slightly near the analysis area on the haziest and clearest days. Blue-shaded circles in Figure 3 indicate negative deciview (dv) changes, which mean that people can see more clearly at greater distances.



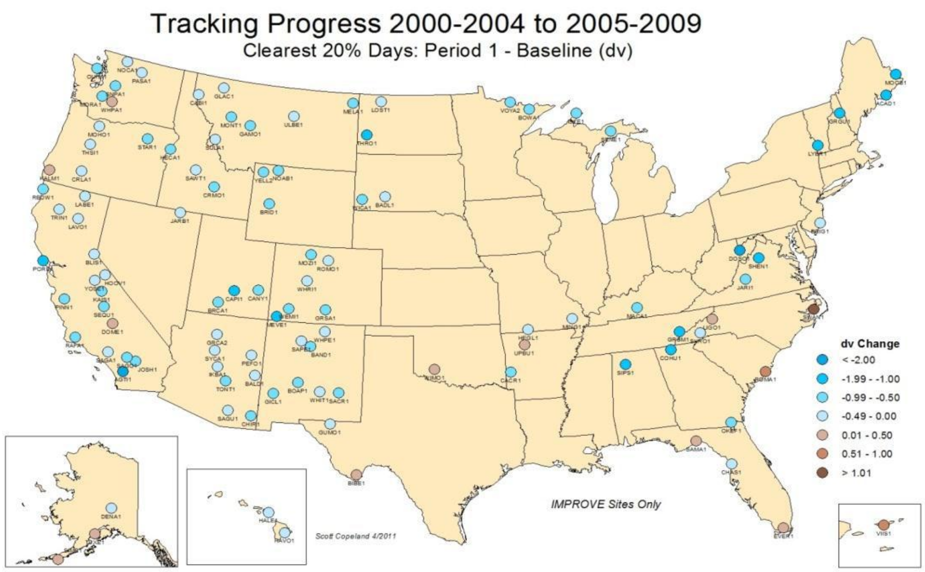


Figure 3. Visibility trends on haziest and clearest days, 2000-2009 (IMPROVE 2011).

Climate Change/Greenhouse Gasses

Climate change is defined by the Intergovernmental Panel on Climate Change (IPCC) as "a change in the state of the climate that can be identified (e.g., using statistical tests) by changes in the mean and/or the variability of its properties, and persist for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or as a result of human activity" (IPCC 2007).

The Intergovernmental Panel on Climate Change (Climate Change SIR[D] 2010) states, "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level." Global average temperature has increased approximately 1.4°F since the early 20th century (Climate Change SIR 2010). Warming has occurred on land surfaces, oceans and other water bodies, and in the troposphere (lowest layer of earth's atmosphere, up to 4-12 miles above the earth). Other indications of global climate change described by the IPCC (Climate Change SIR 2010) include:

- Rates of surface warming increased in the mid-1970s and the global land surface has been warming at about double the rate of ocean surface warming since then;
- Eleven of the last 12 years rank among the 12 warmest years on record since 1850;
- Lower-tropospheric temperatures have slightly greater warming rates than the earth's surface from 1958-2005.

As discussed and summarized in the Climate Change SIR, earth has a natural greenhouse effect wherein naturally occurring gases such as water vapor, CO_2, methane, and N_2O absorb and retain heat. Without the natural greenhouse effect, earth would be approximately 60°F cooler (Climate Change SIR 2010). Current ongoing global climate change is caused, in part, by the atmospheric buildup of greenhouse gases (GHGs), which may persist for decades or even centuries. Each GHG has a global warming potential that accounts for the intensity of each GHG's heat trapping effect and its longevity in the atmosphere (Climate Change SIR 2010). Increased GHG emissions of CO_2, methane, N_2O, and halocarbons since the start of the industrial revolution have substantially increased atmospheric concentrations of these compounds compared to background levels. At such elevated concentrations, these compounds absorb more energy from the earth's surface and re-emit a larger portion of the earth's heat back to the earth rather than allowing the heat to escape into space than would be the case under more natural conditions of background GHG concentrations.

A number of activities contribute to the phenomenon of climate change, including emissions of GHGs (especially carbon dioxide and methane) from fossil fuel development, large wildfires, activities using combustion engines, changes to the natural carbon cycle, and changes to radiative forces and reflectivity (albedo) due to soot deposition and other surface changes. It is important to note that GHGs will have a sustained climatic impact over different temporal scales due to their differences in global warming potential (described above) and lifespans in the atmosphere. For example, CO_2 may last 50 to 200 years in the atmosphere while methane has an average atmospheric life time of 12 years (Climate Change SIR, 2010).

With regard to statewide GHG emissions, Idaho ranks in the lowest decile when compared to all states. The estimate of Idaho's 2011 GHG emissions of 28.5 million metric tons (MMt) of

[D] Although the Climate Change SIR was developed for oil and gas leasing activities in Montana, North Dakota, and South Dakota, conclusions from broader scale analyses/findings are applicable in Idaho.

carbon dioxide equivalent (CO_2e) accounted for approximately 0.43% of the U.S. GHG emissions (WRI 2014).

Some information and projections of impacts beyond the project scale are becoming increasingly available. Chapter 3 of the Climate Change SIR describes impacts of climate change in detail at various scales, including the state scale when appropriate. The following summary characterizes potential changes identified by the EPA (EPA 2014a) that are expected to occur at the regional scale, where the Proposed Action and its alternatives could occur. The EPA identifies Idaho as part of the Northwest region (EPA 2014a):

- The region is expected to experience warmer temperatures with less snowfall.
- Temperatures are expected to increase more in winter than in summer, more at night than in the day, and more in the mountains than at lower elevations.
- Earlier snowmelt means that peak stream flow would be earlier, weeks before the peak needs of ranchers, farmers, recreationalists, and others. In late summer, rivers, lakes, and reservoirs would be drier.
- More frequent, more severe, and possibly longer-lasting droughts are expected to occur.

Other impacts could include:

- Increased particulate matter in the air as drier, less vegetated soils experience wind erosion.
- Shifts in vegetative communities which could threaten plant and wildlife species.
- Changes in the timing and quantity of snowmelt which could affect both aquatic species and agricultural needs.

Projected and documented broad-scale changes within ecosystems of the U.S. are summarized in the Climate Change SIR. Some key aspects include:

- Large-scale shifts have already occurred in the ranges of species and the timing of the seasons and animal migrations. These shifts are likely to continue. Climate changes include warming temperatures throughout the year and the arrival of spring an average of 10 days to two weeks earlier through much of the U.S. compared to 20 years ago. Multiple bird species now migrate north earlier in the year.
- Fires, insect epidemics, disease pathogens, and invasive weed species have increased and these trends are likely to continue. Changes in timing of precipitation and earlier runoff increase fire risks.
- Insect epidemics and the amount of damage that they may inflict have also been on the rise. The combination of higher temperatures and dry conditions have increases insect populations such as pine beetles, which have killed trees on millions of acres in western U.S. and Canada. Warmer winters allow beetles to survive the cold season, which would normally limit populations; while concurrently, drought weakens trees, making them more susceptible to mortality due to insect attack.

More specific to Idaho, additional projected changes associated with climate change described in Section 3.0 of the Climate Change SIR (2010) include:

- Temperature increases are predicted to be between 3 to 5°F at the mid-21st century.

- Precipitation may increase in winter by up to 25%, remain stable during the spring and fall, and decrease by up to 25% during the summer.
- Predicted annual runoff for 2041–2060 compared to 1901–1970 is expected to remain stable.
- Wildland fire risk is predicted to continue to increase due to climate change effects on temperature, precipitation, and wind. One study predicted an increase in median annual area burned by wildland fires in southern Idaho based on a 1°C global average temperature increase to be 111%.

While long-range regional changes might occur within this analysis area, it is impossible to predict precisely when they could occur. The following example summarizing climate data for the Idaho Southwestern Valleys illustrates this point at a regional scale. A potential regional effect of climate change is earlier snowmelt and associated runoff. This is directly related to spring-time temperatures. Over a 119-year record, temperatures increased 0.08 degrees per decade (Figure 4). This would suggest that runoff may be occurring earlier than in the past. However, data from 1994-2014 indicates a 0.5 degree per decade cooling trend (Figure 5). This example is not an anomaly, as several other 20-year windows can be selected to show either warming or cooling trends. Some of these year-to-year fluctuations in temperature are due to natural processes, such as the effects of El Niños, La Niñas, and the eruption of large volcanoes. This information illustrates the difficulty of predicting actual short-term regional or site-specific changes or conditions which may be due to climate change during any specific time frame.

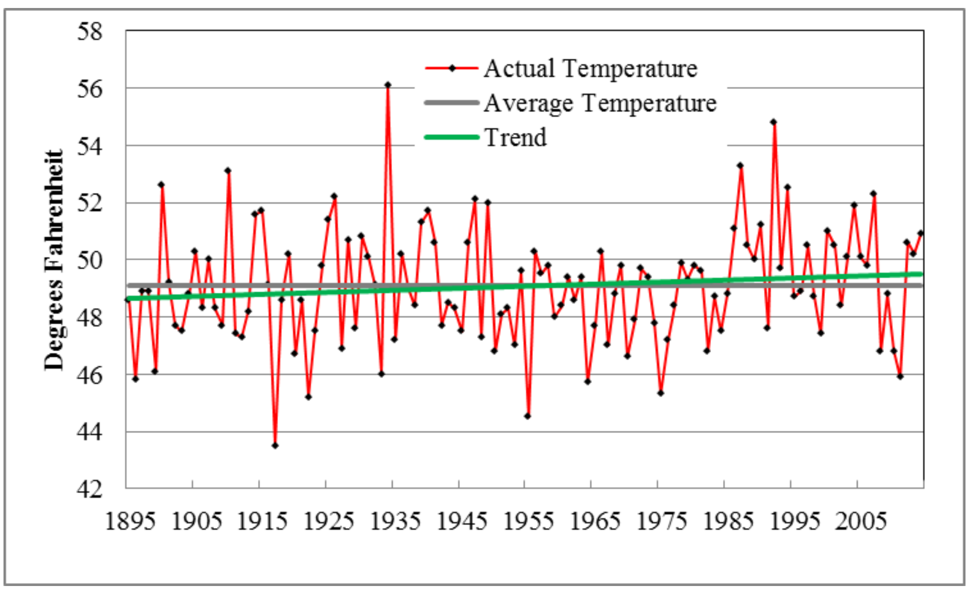


Figure 4. Regional climate summary of spring temperatures (March-May) for Idaho Southwestern Valleys, from 1895-2014. (Source: NOAA website http://www.ncdc.noaa.gov/oa/climate/research/cag3/wn.html)

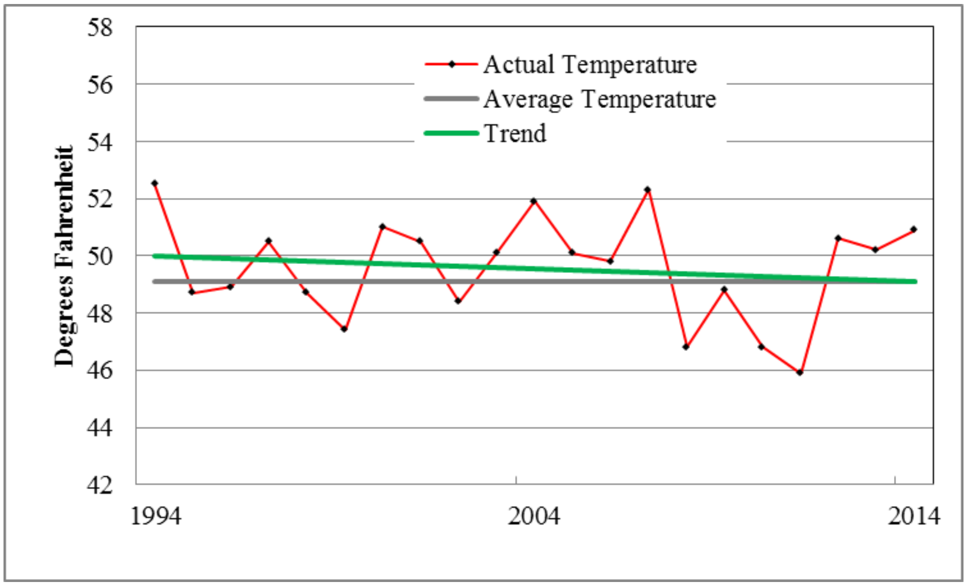


Figure 5. Regional climate summary of spring temperatures (March-May) for Idaho Southwestern Valleys, from 1994-2014. (Source: NOAA website http://www.ncdc.noaa.gov/oa/climate/research/cag3/wn.html)

3.4.2 Environmental Consequences – Air Resources

Impacts to air resources are based on the RFDS created for this document (Table 2, Appendix 1).

3.4.2.1 General Discussion of Impacts

Air Quality

Potential impacts of development could include increased airborne soil particles blown from new well pads or roads; exhaust emissions from drilling equipment, compressors, vehicles, and dehydration and separation facilities; as well as potential releases of GHGs and VOCs during drilling or production activities. The amount of increased emissions cannot be precisely quantified at this time since it is not known for certain how many wells might be drilled, the types of equipment needed if a well were to be completed successfully (e.g., compressor, separator, dehydrator), or what technologies may be employed by a given company for drilling any new wells. The degree of impact would also vary according to the characteristics of the geologic formations from which production occurs, as well as the scope of specific activities proposed in an APD. Oxides of nitrogen, carbon monoxide, volatile organic compounds, carbon dioxide, and methane are the most common emissions from a typical well (Green River, Wyoming; Table 6). The Kleinfelder report provides estimated pollutants for wells in three locations (San Juan, Uinta/Piceance, and Upper Green River basins). This analysis uses the Upper Green River values which represent the upper end of pollution production in the examples. The majority of pollution occurs during the production phase, where fugitive emissions (e.g., leaking pipes and valves) and dump valves (used to control the amount of fluid in the product) are the primary sources.

Climate Change/Greenhouse Gases

Sources of GHGs associated with development of lease parcels include construction activities, operations, and facility maintenance in the course of oil and gas exploration, development, and production. Estimated GHG emissions are discussed for these specific aspects of oil and gas activity because the BLM has direct involvement in these steps. Anticipated GHG emissions are based on emissions calculators developed by air quality specialists at the BLM National Operations Center in Denver, Colorado, based on a typical well in Green River Wyoming (Table 6).

3.4.2.2 Alternative A

Air Quality

Two new State lease wells and associated infrastructure would have minor adverse impacts on air quality over the long term. Small increases in nitrogen oxides (2%), carbon monoxide (0.1%), sulfur dioxide (<0.01%), and particulate matter (0.4%) would occur annually (Table 6). Good AQI values would likely predominate; however, well emissions could slightly increase the number of moderate AQI days especially during inversions. There would be negligible decreases in visibility, primarily within 1-2 miles of the wells.

Climate Change/Greenhouse Gases

Emissions from two new wells on State leases would increase Payette County's annual carbon dioxide equivalent production by 2.4% (Table 6).

3.4.2.3 Alternative B

Air Quality

Twenty-two new BLM lease wells and associated infrastructure would have moderate adverse impacts on air quality over the long term. Increases in nitrogen oxides (22%), carbon monoxide (1.4%), sulfur dioxide (0.02%), and particulate matter (4.5%) would occur annually (Table 6). The percent of days rated good AQI could decrease, especially during inversions. There would be minor decreases in visibility, primarily within 1-2 miles of the wells.

Climate Change/Greenhouse Gases

Twenty-two new wells on BLM leases would increase Payette County's annual carbon dioxide equivalent production by 26.2% (Table 6).

3.4.2.4 Alternative C

Air Quality

Twenty-five new BLM lease wells and associated infrastructure would have moderate adverse impacts on air quality over the long term. Controlled surface use stipulations could reduce some pollutants when or where they are in effect (e.g., the winter use restriction CSU-4 would reduce or eliminate some pollutants [e.g., PM_{10}] between December 1 and March 31; minimizing disturbance of fragile soils could reduce dust over the long term). Increases in nitrogen oxides (25%), carbon monoxide (1.6%), sulfur dioxide (0.03%), and particulate matter (5.1%) would occur annually (Table 6). The percent of days rated good AQI could decrease, especially during inversions. There would be minor decreases in visibility, primarily within 1-2 miles of the wells.

Climate Change/Greenhouse Gases

Twenty-five new wells on BLM leases would increase Payette County's annual carbon dioxide equivalent production by 29.7% (Table 6).

3.4.3 Mitigation

The BLM encourages industry to incorporate and implement BMPs to reduce impacts to air quality and climate change by reducing emissions, surface disturbances, and dust from field production and operations. Measures may also be required as COAs on permits by either the BLM or IDEQ. The BLM also manages venting and flaring of gas from federal wells as described in the provisions of Notice to Lessees (NTL) 4A, Royalty or Compensation for Oil and Gas Lost.

Some of the following measures could be imposed at the development stage:

- flare or incinerate hydrocarbon gases at high temperatures to reduce emissions of incomplete combustion;
- install emission control equipment of a minimum 95% efficiency on all condensate storage batteries;
- install emission control equipment of a minimum 95% efficiency on dehydration units, pneumatic pumps, produced water tanks;
- operate vapor recovery systems where petroleum liquids are stored;
- use Tier II or greater, natural gas or electric drill rig engines;
- operate secondary controls on drill rig engines;
- use no-bleed pneumatic controllers (most effective and cost effective technologies available for reducing volatile organic compounds (VOCs));
- operate gas or electric turbines rather than internal combustions engines for compressors;
- use nitrogen oxides (NO_x) emission controls for all new and replaced internal combustion oil and gas field engines;
- water dirt and gravel roads during periods of high use and control speed limits to reduce fugitive dust emissions;
- perform interim reclamation to re-vegetate areas of the pad not required for production facilities and to reduce the amount of dust from the pads.
- co-locate wells and production facilities to reduce new surface disturbance;
- use directional drilling and horizontal completion technologies whereby one well provides access to petroleum resources that would normally require the drilling of several vertical wellbores;
- operate gas-fired or electrified pump jack engines;
- install velocity tubing strings;
- use cleaner technologies on completion activities (i.e. green completions), and other ancillary sources;
- use centralized tank batteries and multi-phase gathering systems to reduce truck traffic;
- forward looking infrared (FLIR) technology to detect fugitive emissions; and
- perform air monitoring for NO_x and ozone (O_3).

Specifically with regard to reducing GHG emissions, Section 6.0 of the Climate Change SIR identifies and describes in detail commonly used technologies to reduce methane emissions from natural gas production operations. Technologies discussed in the Climate Change SIR and as summarized in Table 7 (reproduced from Table 6-2 in Climate Change SIR), display common methane emission technologies reported under the EPA Natural Gas STAR Program and associated emission reduction, cost, maintenance, and payback data.

Table 7. Selected methane emission reductions reported under the EPA Natural Gas STAR Program.

Source Type / Technology	Annual Methane Emission Reduction [1] (Mcf/yr)	Capital Cost Including Installation ($1,000)	Annual Operating and Maintenance Cost ($1,000)	Payback (Years or Months)	Payback Gas Price Basis ($/Mcf)
Wells					
Reduced emission (green) completion	7,000 [2]	$1 – $10	>$1	1 – 3 yr	$3
Plunger lift systems	630	$2.6 – $10	NR	2 – 14 mo	$7
Gas well smart automation system	1,000	$1.2	$0.1 – $1	1 – 3 yr	$3
Gas well foaming	2,520	>$10	$0.1 – $1	3 – 10 yr	NR
Tanks					
Vapor recovery units on crude oil tanks	4,900 – 96,000	$35 – $104	$7 – $17	3 – 19 mo	$7
Consolidate crude oil production and water storage tanks	4,200	>$10	<$0.1	1 – 3 yr	NR
Glycol Dehydrators					
Flash tank separators	237 – 10,643	$5 – $9.8	Negligible	4 – 51 mo	$7
Reducing glycol circulation rate	394 – 39,420	Negligible	Negligible	Immediate	$7
Zero-emission dehydrators	31,400	>$10	>$1	0 – 1 yr	NR
Pneumatic Devices and Controls					
Replace high-bleed devices with low-bleed devices					
End-of-life replacement	50 – 200	$0.2 – $0.3	Negligible	3 – 8 mo	$7
Early replacement	260	$1.9	Negligible	13 mo	$7
Retrofit	230	$0.7	Negligible	6 mo	$7
Maintenance	45 – 260	Negl. to $0.5	Negligible	0 – 4 mo	$7
Convert to instrument air	20,000 (per facility)	$60	Negligible	6 mo	$7
Convert to mechanical control systems	500	<$1	<$0.1	0 – 1 yr	NR
Valves					
Test and repair pressure safety valves	170	NR	$0.1 – $1	3 – 10 yr	NR
Inspect and repair compressor station blowdown valves	2,000	<$1	$0.1 – $1	0 – 1 yr	NR

Source Type / Technology	Annual Methane Emission Reduction [1] (Mcf/yr)	Capital Cost Including Installation ($1,000)	Annual Operating and Maintenance Cost ($1,000)	Payback (Years or Months)	Payback Gas Price Basis ($/Mcf)
Compressors					
Install electric compressors	40 – 16,000	>$10	>$1	>10 yr	NR
Replace centrifugal compressor wet seals with dry seals	45,120	$324	Negligible	10 mo	$7
Flare Installation	2,000	>$10	>$1	None	NR

Source: Multiple EPA Natural Gas STAR Program documents. Individual documents are referenced in Climate Change SIR (2010).

[1] Unless otherwise noted, emission reductions are given on a per-device basis (e.g., per well, per dehydrator, per valve, etc).

[2] Emission reduction (Mcf = thousand cubic feet of methane) is per completion, rather than per year.

NR = not reported

3.4.4 Cumulative Impacts – Air Resources

Cumulative impacts to air resources are based on the RFDS created for this document (Appendix 1), RFDS for Hamilton and Willow fields, and the actions discussed below.

3.4.4.1 Scope of Analysis

The CIAA includes the airshed associated with Ada, Baker, Canyon, and Payette counties. Because of prevailing wind patterns, changes in Baker County air quality would affect Payette County and impacts from Payette County air quality would dissipate at the eastern side of Ada County. The analysis period covers the 10-year lease period; however, pollutants are reported by their annual production levels.

3.4.4.2 Current Conditions and Effects of Past and Present Actions

Because of a large population base (615,335 people in 2013), Ada and Canyon counties contribute substantial amounts of nitrogen oxides (79%), PM_{10} (83%), volatile organic compounds (75%), hazardous air pollutants (87%), and GHG (80%) to the four-county total pollution (Table 6). Baker County, with a relatively small population (16,018 people in 2013) and large area (3,068 mi^2 compared with 2,047 mi^2 for the other three counties combined), accounts for 71% of methane production, while other pollutant contributions vary from 7-24% of totals. The majority of growth during the 10-year period is expected to occur in Ada and Canyon counties; therefore, pollutant contributions from growth-related activities (e.g., construction, vehicle emissions, dust, and manufacturing) in these counties would be expected remain similar or increase proportionately more than Baker and Payette counties.

3.4.4.3 Reasonably Foreseeable Future Actions

An estimated 53 wells could come into production in the Hamilton (33,400 acres) and Willow (7,000 acres outside the proposed lease area) fields (Map 1). These wells would contribute from<0.01-3.4% of most pollutants; however, they would cause a 51% increase in methane production annually. AM Idaho (Alta Mesa’s Idaho subsidiary) is constructing a hydrocarbon liquid treatment (dehydrator) facility (4 miles south of New Plymouth, Idaho), an ancillary processing facility (1 mile east of New Plymouth), and associated pipelines from wells to the facilities. AM Idaho has applied for an IDEQ air quality permit for the facilities. Typical pollutants include NO_x, CO, particulate matter, HAP, and VOCs; however, the levels are unknown.

3.4.4.4 Alternative A – Cumulative Impacts

Two additional wells in the proposed lease area would have negligible additive impacts to air quality and GHG pollutants over the long term. Wells in the Hamilton and Willow fields and gas processing facilities would have minor (e.g., 3.7% CO2 eq increase in CIAA) to major (51% methane increase in CIAA) additive impacts (Table 6), whereas, with the exception of methane gas, growth-related activities would account for the majority of pollutant increases.

3.4.4.5 Alternative B– Cumulative Impacts

Twenty-two wells in the proposed lease area would have negligible additive impacts to air quality and most GHG pollutants over the long term and would account for a 1.5% increase in methane over current levels (Table 6). Pollutants from other sources would be as described in Alternative A (Section 3.4.4.4).

3.4.4.6 Alternatives C and D – Cumulative Impacts

Twenty-five wells in the proposed lease area would have negligible additive impacts to air quality and most GHG pollutants over the long term and would account for a 1.6% increase in methane over current levels (Table 6). Pollutants from other sources would be as described in Alternative A (Section 3.4.4.4).

3.5 Water Resources

3.5.1 Affected Environment – Water Resources

<u>Surface Hydrology and Water Quality</u>

Surface water quality in the planning area is variable due to the highly erratic discharge and moderately to highly erosive nature of the geologic parent material and soils. Perennial streams retain water year-round and have variable flow regimes. Big Willow (0.8 miles) and Little Willow (5 miles) creeks, perennial streams in the proposed lease area, are not a directly associated with proposed lease parcels. Intermittent streams flow during the part of the year when they receive sufficient water from springs, ground water, or surface sources such as snowmelt or storm events. Ephemeral streams flow only in direct response to precipitation and snowmelt. Ephemeral and intermittent streams (approximately 22 miles) occur in the proposed lease area with 8.2 miles directly associated with federal mineral estate. The Bolton and Patton irrigation canals parallel the north side of Little Willow Creek and the McIntyre and Nelson canals parallel on the south side. These canals remove the majority of water from Little Willow Creek during the irrigation season.

The National Wetland Inventory mapping identifies approximately 56 acres of wetland and riparian areas that are associated with perennial streams, canals, and ponds (Map 5). There are two springs and one seep associated with federal mineral estate. There are three ponds associated with federal mineral estate and seven other ponds in the proposed lease area. The ponds are fed by intermittent/ephemeral streams or irrigation runoff and are typically used as livestock water sources.

Big Willow Creek has an EPA approved temperature total maximum daily level (TMDL) that is not being met (IDEQ 2014). Little Willow Creek below Paddock Valley Reservoir was rated as Unassessed Waters (IDEQ 2014). In 2007, Little Willow Creek suspended sediment levels ranged from 10-165 mg/L. High levels (>30 mg/L) were associated with the irrigation season (May 1 – September 30) and IDEQ recommended a target of 22 mg/L during that period to support cold water aquatic beneficial uses.

There are 352 acres of 100-year floodplain associated with Little Willow and Big Willow creeks and an ephemeral drainage; however, only acre is associated with federal mineral estate.

The lease parcels are located within four hydrologic unit code (HUC) 6 watershed subbasins: Little Willow Creek (HUC 1705012208), Big Willow Creek (HUC 1705012207), Payette River-Snake River (HUC 1705012209), and Jacobsen Gulch – Snake River (HUC 1705011502) (Table 8). The acreage federal mineral reserve comprises between 0.06% (Payette River – Snake River) and 6.2% (Little Willow Creek) of each watershed.

Table 8. Acres and percentage of Level 6 HUC watersheds associated with federal mineral estate and Little Willow Creek lease area, Payette County, Idaho.

Watershed		**Federal Mineral Reserve**		**Total Lease Area**	
Name	**Acres**	**Acres**	**% Watershed**	**Acres**	**% Watershed**
Little Willow Creek	98,464	6,094	6.2	14,182	14.4
Big Willow Creek	98,919	84	0.08	694	0.7
Payette River – Snake River	177,466	106	0.06	629	0.4
Jacobsen Gulch – Snake River	91,054	67	0.07	139	0.2

Ground Water

The quality and availability of ground water varies greatly across Idaho. Residents in Payette County commonly get their ground water from aquifers consisting of unconsolidated, alluvial valley-fill materials, typically sand and gravel deposits. Alluvial aquifers occur in terrace deposits and within the floodplains, and along the channels of larger streams, tributaries, and rivers, and are important sources of ground water. Based on 41 wells in the lease area authorized by IDWR, typical domestic supply wells in the area are between 37-405 feet deep with standing water occurring at 5-330 feet and production occurring between 7-533 feet. Well water is typically used for domestic, livestock, and irrigation purposes.

Nitrate is present in shallow ground water beneath the Payette Valley at concentrations that occasionally exceed the drinking water standard of 10 milligrams per liter (mg/L; IDEQ 2012). Arsenic has been detected in exceedance of the drinking water standard of 0.010 mg/L. Fluoride has been detected occasionally at concentrations that exceed the drinking water standard of 4 mg/L, and dissolved iron and manganese have exceeded the secondary standards of 0.3 mg/L and 0.05 mg/L, respectively.

3.5.2 Environmental Consequences – Water Resources

Impacts to water resources are based on the RFDS created for this document (Table 2, Appendix 1).

3.5.2.1 General Discussion of Impacts

<u>Surface Hydrology and Water Quality</u>

The magnitude of the impacts to water resources would be dependent on the specific activity, season, proximity to waterbodies, location in the watershed, upland and riparian vegetation condition, effectiveness of mitigation, and the time until reclamation success. Surface disturbance effects typically are localized, short-term, and occur from implementation through vegetation reestablishment. As acres of surface-disturbance increase within a watershed, so could the effects on water resources.

Oil and gas exploration and development could cause the removal of vegetation, soil compaction, and soil disturbance in uplands within the watershed, 100-year floodplains of non-major streams, and non-riparian, ephemeral waterbodies. The potential effects from these activities could be accelerated erosion, increased overland flow, decreased infiltration, increased water temperature, channelization, and water quality degradation associated with increased sedimentation, turbidity, nutrients, metals, and other pollutants. Erosion potential can be further increased in the long term by soil compaction and low permeability surfacing (e.g. roads and well pads) which increases the energy and amount of overland flow and decreases infiltration, which in turn changes flow characteristics, reduces ground water recharge, and increases sedimentation and erosion.

Water withdrawals for drilling operations would lead to reduced aquifer water levels, reduced streamflow, and impacts to some water quality parameters associated with stream flow. These impacts to water quality may include increased water temperature, decreased concentrations of dissolved oxygen, and increases in other parameters such as salinity levels, sodium adsorption ratio, and introduction of drilling pollutants (e.g., organic acids, alkalis, diesel oil, crankcase oils, hydrochloric and hydrofluoric acids, chloride, sodium, calcium, magnesium, potassium, polycyclic aromatic hydrocarbons, lead, arsenic, barium, antimony, sulfur, zinc, and naturally occurring radioactive materials) (TEEIC 2014). Ground water removal would result in a depletion of flow in nearby streams and springs if the aquifer is hydraulically connected to such features. Typically produced water from conventional oil and gas wells is from a depth below useable aquifers.

<u>Ground Water</u>

Spills, drilling fluids, fracking fluids, or produced fluids could potentially impact surface and ground water resources over the long term. Drilling in the proposed lease area would most likely pass through useable ground water. Potential impacts to ground water resources could occur if proper cementing and casing programs are not followed. This could include loss of well integrity, failed cement, surface spills, and/or the loss of drilling, completion, and hydraulic fracturing fluids into groundwater. It is possible for chemical additives used in drilling activities to be introduced into ground water producing formations without proper casing and cementing of the well bore. Concentrations of these additives also vary considerably and are not always known because different mixtures can be used for different purposes in gas development and even in the same well bore. Changes in porosity or other properties of the rock being drilled can result in the loss of drilling fluids. When this occurs, drilling fluids can be introduced into ground water in the absence of proper cementing and casing. Site specific conditions and drilling practices determine the probability of this occurrence and determine the ground water resources that could be impacted. Some or all of the produced water from these leases is likely to be injected in wells for disposal. Improper construction and management of reserve and evaporation pits could degrade ground water quality through leakage and leaching.

The potential for adverse ground water impacts caused from hydraulic fracturing are currently being investigated by the EPA. Currently, water use to drill one well ranges between 1 and 6 million gallons. In fracturing a well, companies have estimated that generally they use a ratio of 0.5% hydraulic chemical fluid mix to 1.5 million gallons of water. That translates to a minimum of 5,000 gallons of chemicals into one well for every 1.5 million gallons of water used to fracture a well. In addition to changing the producing formations' physical properties by increasing the flow of water, gas, and/or oil around the well bore; hydraulic fracturing can also introduce chemical additives into the producing formations. Production zones generally do not contain fresh water. Types of chemical additives used in drilling activities may include acids, hydrocarbons, thickening agents, lubricants, and other additives that are operator and location specific. These additives are not always used in these drilling activities and some are likely to be benign such as bentonite clay and sand. Concentrations of these additives also vary considerably because different mixtures can be used for different purposes in oil and gas development and even in the same well bore. If contamination of aquifers from any source occurs, changes in ground water quality could impact springs and residential wells that are sourced from the affected aquifers.

If contamination of freshwater aquifers from oil and gas development occurs, changes in ground water quality could impact springs and residential wells if these springs and residential wells are sourced from the same aquifers that have been affected. Direct impacts to surface water would likely be greatest shortly after the start of construction activities and would likely decrease in time due to natural stabilization, and reclamation efforts. Ground water impacts would be less evident and occur on a longer time scale. Construction activities would occur over a relatively short period (commonly less than a month); however, natural stabilization of the soil can sometimes takes years to establish to the degree that would adequately prevent accelerated erosion caused by compaction and removal of vegetation. Spills or produced fluids (e.g., saltwater, oil, fracking chemicals, and/or condensate in the event of a breech, overflow, or spill from storage tanks) could result in contamination of the soil onsite, or offsite, and may potentially impact surface and ground water resources in the long term.

Not all wells resulting from an APD would employ fracturing, and water consumption would be temporary. Oil and gas wells are cased and cemented at a depth below all usable water zones; consequently impacts to water quality at springs and residential wells are not expected.

However, faulty cementing or well casing could result in methane migration to upper zones. Should hydrocarbon or associated chemicals for oil and gas development in excess of EPA/IDEQ standards for minimum concentration levels migrate into culinary water supply wells, springs, or systems, it could result in these water sources becoming non-potable.

For federal mineral estate wells, Onshore Order #2 requires that the proposed casing and cementing programs shall be conducted as approved to protect and/or isolate all usable water zones. For State-regulated wells, IDAPA 20.07.02 provides similar requirements from initial drilling to plugging. Authorization of exploration and production activities would require full compliance with local, state, and federal directives and stipulations that relate to surface and ground water protection.

3.5.2.2 Alternative A

Surface Hydrology and Water Quality

Not leasing 6,349 acres would limit surface disturbance in those areas. Vegetation and soil conditions would be maintained over the long term minimizing sediment input to waterbodies from 6% of the Little Willow Creek watershed and negligible (0.2%) portions of other watersheds (Table 8). Development of two wells and associated infrastructure (7 acres of disturbance) would have negligible (~0.001% of Little Willow Creek watershed) direct impacts to surface hydrology. Negligible (>0.25 miles from stream) to moderate (<200 feet from stream) short-term sediment inputs could occur to Little Willow Creek until vegetation reestablishment occurs. Produced water and pollutants carried by natural events would cause adverse water quality impacts where pollutants reach Little Willow Creek. The longevity and severity of the impacts would depend on the type of pollutant. Ground water depletion could adversely affect Little Willow Creek.

Ground Water

Direct development and production ground water impacts would not occur on 6,349 acres. Development of two wells could have negligible (well casings are effectively implemented) to major (well casings fail and persistent, toxic pollutants are introduced) adverse effects to ground water quality in the Little Willow Creek drainage. Up to 15 domestic and agricultural wells in the immediate vicinity and downstream could be affected.

3.5.2.3 Alternative B

Surface Hydrology and Water Quality

Leasing 6,349 acres with NSO and NSSO stipulations would limit surface disturbance in those areas. Vegetation and soil conditions would be maintained over the long term minimizing sediment input to waterbodies from 6% of the Little Willow Creek watershed and negligible (0.2%) portions of other watersheds (Table 8). Development of 22 wells and associated infrastructure (77 acres of disturbance) would have negligible to minor direct impacts to surface hydrology, primarily where roads collect and convey water rather than allowing infiltration. Impacts from sediment inputs would be similar to Alternative A (Section 3.5.2.2); however, four additional wells could be drilled near Little Willow and Big Willow creeks. Produced water and pollutant impacts could affect Little Willow and Big Willow creeks. Four additional wells would increase the probability of adverse water quality and ground water depletion impacts.

Ground Water

Direct development and production ground water impacts would not occur on 6,349 acres. Development of 22 wells could have negligible (well casings are effectively implemented) to major (persistent, toxic pollutants are introduced) adverse effects to ground water quality in the Little Willow and Big Willow drainages; however, the number of wells could increase the probability of a pollution event. Up to 54 domestic and agricultural wells in the immediate vicinity and downstream could be affected.

3.5.2.4 Alternative C

Surface Hydrology and Water Quality

Leasing 6,349 acres with CSU stipulations would limit surface disturbance in those areas. Vegetation and soil conditions would be maintained over the long term minimizing sediment input to waterbodies from 6% of the Little Willow Creek watershed and negligible (0.2%) portions of other watersheds (Table 8). Development of 25 wells and associated infrastructure (88 acres of disturbance) would have similar hydrology and sediment impacts to Alternative B (Section 3.5.2.3); however, 500 foot CSU buffers from waterbodies would help limit sediment inputs (Map 5). Fewer surface occupancy restrictions would allow wells to be placed further from streams relative to Alternative B. Produced water and pollutant impacts could affect Little Willow and Big Willow creeks; however, CSU buffers would reduce the probability of pollutants reaching waterbodies.

Ground Water

Direct development and production ground water impacts could occur on <6,162 acres. Development of 25 wells could have similar impacts to those described in Alternative B (Section 3.5.2.3); however, the probability of a pollution event could be slightly greater.

3.5.3 Mitigation

Mitigation measures that minimize the total area of disturbance, control wind and water erosion, reduce soil compaction, maintain vegetative cover, control nonnative species, and expedite rapid reclamation (including interim reclamation) would maintain surface hydrology processes and water quality. Methods to reduce erosion and sedimentation could include: reducing surface disturbance acres; installing and maintaining adequate erosion control; proper road design, road surfacing, and culvert design; road/infrastructure maintenance; use of low water crossings; and use of isolated or bore crossing methods for waterbodies and floodplains. In addition, applying mitigation to maintain adequate, undisturbed, vegetated buffer zones around waterbodies and floodplains could reduce sedimentation and maintain water quality. Lining ponds would minimize seepage of potentially toxic chemicals into ground water. Closing and rehabilitating ponds promptly, when no longer functional or needed, would exposure to toxic substances. Appropriate well completion, the use of Spill Prevention Plans, and Underground Injection Control (UIC) regulations would mitigate ground water impacts. Site-specific mitigation and reclamation measures would be described in the COAs.

Known water bearing zones in the lease area are protected by drilling requirements and, with proper practices, contamination of ground water resources would be unlikely (IOGCC 2013b; IDAPA 20.07.02). Casing along with cement would be extended well beyond fresh-water zones to insure that drilling fluids remain within the well bore and do not enter ground water. Potential impacts to ground water at site specific locations are analyzed through the NEPA review process at the development stage when the APD is submitted. This process includes geologic and engineering reviews and onsite oversight to ensure that cementing and casing programs are adequate to protect all downhole resources. All water used would have to comply with State water rights regulations and a source of water would need to be secured by industry that would not harm senior water rights holders.

3.5.4 Cumulative Impacts – Water Resources

Cumulative impacts to water resources are based on the RFDS created for this document (Appendix 1), RFDS for Hamilton and Willow fields, and the actions discussed below.

3.5.4.1 Scope of Analysis

The 65,700-acre CIAA includes portions of the Little Willow Creek, Big Willow Creek, and Payette River-Snake River (north of the Farmers Canal) Level 6 HUC watersheds downstream of the eastern boundary of the proposed lease area and the majority of the Payette Valley Flow System (Map 5). This represents an area that could potentially be affected by surface runoff and ground water pollutants. The analysis period covers the 10-year lease period; however, pollutants would be expected to travel at different rates in different systems. Surface pollutants could reach the downstream portion of the CIAA relatively quickly once they enter flowing waters. Conversely, ground water pollutants would likely take considerably longer to travel beyond the source.

3.5.4.2 Current Conditions and Effects of Past and Present Actions

Sagebrush and other shrubs (11,067 acres; 17% of CIAA), exotic annuals (13,716 acres; 21%), agriculture (35,404 acres; 54%), urban (2,271 acres; 3%), and perennial bunchgrass (2,452 acres; 4%) comprise the majority of cover types. Roads, ploughed fields and exotic annual cover provide the lowest degree of watershed protection. Watershed stability is at greatest risk where these cover types occur in moderate or highly erosive soils. Most agricultural lands are irrigated with surface (from canals) or ground water.

There are approximately 56.5 miles of perennial streams (Payette River, Little Willow and Big Willow creeks) and all are influenced by irrigation outtake and return flows. There are approximately 2,000 acres of wetland, riparian, and pond habitat. Stream and riparian conditions are similar to those described in Section 3.6.1. The 9,760 acres of floodway are primarily associated with the Payette River. There are 1,305 water wells, most occur south of the Payette River or northwest of the confluence of Little Willow Creek and the Payette River.

Potential pollutant sources include pesticides from agricultural and urban areas, chemicals from industrial and retail businesses, runoff from roadways, and 15 existing oil and gas wells. The amount of pollutants from these sources is unknown.

3.5.4.3 Reasonably Foreseeable Future Actions

At least 37 additional oil and gas wells could be drilled (1 well/640 acres in the portions of the Willow and Hamilton fields in the CIAA). Pollutants from development and production would be as described in Section 0. Wildfires, as described in other sections, would be expected to cause short-term increases in sediment inputs and watershed instability until vegetation cover is reestablished.

3.5.4.4 Alternative A – Cumulative Impacts

Surface Hydrology and Water Quality

Not leasing 6,349 acres (10% of the CIAA) would have negligible to minor additive benefits to surface hydrology and water quality. Wildfires, exotic annuals, and ploughed fields would potentially affect much larger areas. Rain events in these areas could result in minor to major sediment inputs to floodways and streams. Burned riparian areas would recover within five years, but upland areas would likely become dominated by exotic annuals and remain susceptible to erosion events. The extent of ground water withdrawal for irrigation is unknown. Irrigation water removal and return water pollutants (both agricultural and urban) would annually have moderate to major adverse water quality impacts to perennial streams. Development and production at up to 37 oil and gas wells would have negligible surface hydrology impacts, but could have negligible (no spills occur, spills are largely contained on site, or spills are non-pollutant materials) to major (spills affect domestic water supplies with toxic pollutants) adverse water quality impacts.

Ground Water

Not leasing 6,349 acres would have negligible additive ground water benefits. Agricultural activities (e.g., ground water pumping, pollution input from leaking wells) would have minor (seasonal reductions in water availability, pollution stays in immediate vicinity of well) to major (increased use of ground water during extended drought periods, pollutants migrate from well to domestic water supplies) adverse impacts to ground water availability and quality over the short and long term. Pollutants from industrial and urban sources could have minor to major short or long term adverse impact to ground water quality. Development and production at up to 37 oil and gas wells would have negligible (well casings are effectively implemented, ground water is not used to produce gas) to major (persistent, toxic pollutants are introduced; ground water is used to produce gas) adverse effects to ground water availability and quality.

3.5.4.5 Alternatives B and C – Cumulative Impacts

Surface Hydrology and Water Quality

Leasing 6,349 acres with some surface stipulations and development of 22-25 wells and associated infrastructure would have negligible to minor additive impacts to surface hydrology and increased sediment input. Minor to moderate additive water quality impacts from produced water and pollutants could occur. Impacts from other activities would be as described in Alternative A (Section 3.5.4.4).

Ground Water
Development and production at 22-25 wells would have negligible (well casings are effectively implemented) to major (persistent, toxic pollutants are introduced) adverse additive effects to ground water availability and quality. Impacts from other activities would be as described in Alternative A (Section 3.5.4.4).

3.6 Wildlife/Special Status Animals

3.6.1 Affected Environment – Wildlife/Special Status Animals

Habitats support a variety of special status wildlife including southern Idaho ground squirrel (SIDGS), a candidate species under the ESA, 14 other mammal species, 17 bird species, three amphibian species, and three reptile species (Appendix 4). Habitat conditions are described for representative groups of animals (migratory birds, southern Idaho ground squirrels, big game, and amphibians/fish).

Vegetation composition has been shaped by physical site characteristics such as aspect, soils, precipitation, and disturbances (primarily wildland fire, livestock grazing, and agricultural development). Fires and long-term spring grazing have reduced the diversity and abundance of native perennial forbs and grasses, favoring exotic annuals. The resulting conditions (Section 3.2.1) generally provide poor quality habitat for most species. Shrub-dominated communities comprise 32% of cover, annual and perennial grasslands and agriculture characterize the remainder. Although these disturbances have occurred on all aspects, native vegetation is less resilient on the hotter, drier southerly aspects than the cooler, moister northerly aspects; therefore, southerly aspects are dominated by exotic grasses and northerly aspects are dominated by native vegetation. This has resulted in major habitat fragmentation. The proposed lease area has approximately 36.6 miles of roads and trails (1.5 miles/mi^2). Access to many roads is restricted by private landowners; therefore, the majority of roads have minor fragmentation and disturbance impacts.

Migratory Birds and Raptors
The analysis area encompasses over 15,000 acres; therefore, bird habitat will be analyzed at a landscape scale, where birds are typically affected on a population level (Paige and Ritter 1999). Because the area lacks contiguous sagebrush habitat and suitable cover of native perennial bunchgrasses and forbs, it does not support stable populations of sagebrush-obligate species such as greater sage-grouse[E]. These sagebrush obligates require a large mosaic of big sagebrush cover

[E] Based on 2014 sage-grouse habitat maps developed by BLM and IDFG and lek monitoring data, the proposed lease area is approximately 1 mile from R2 (sagebrush with annual grass understory) habitat, 5 miles (isolated habitat) from key (sagebrush with perennial grass understory) and preliminary general habitat [areas outside of breeding habitat that support important seasonal (winter, summer, fall habitat, migration corridors) or year-round habitat for sage-grouse], and 6.5 miles (contiguous habitat) from key and preliminary priority [areas that have the highest conservation value (breeding, nesting, brood-rearing) to maintaining sage-grouse populations] sage-grouse habitats. The closest leks are 9.5 (active) or 10.5 (inactive) miles away.

types, inter-mixed with native bunchgrasses and forbs. Other sagebrush obligates including Brewer's sparrow, sage sparrow, and sage thrasher could be present during the spring and summer; however, these species are also sensitive to fragmented sagebrush habitats and they occur in low numbers.

Grassland associated species such as long-billed curlew, western meadowlark, vesper sparrow, and horned lark utilize short grassland habitat for nesting, breeding, and brood-rearing. Long-billed curlew populations have declined in nearby areas (i.e., Long-billed Curlew Habitat Area of Critical Environmental Concern 8-20 miles southeast of the lease area) primarily due to recreational activities and development. Between 1966 and 2012, vesper sparrow, western meadowlark, and horned lark populations in Idaho have also declined. Northern harrier, red-tailed hawk, ferruginous hawk, golden eagle, American kestrel, and turkey vulture are common birds of prey that hunt for insects, small mammals, birds, and carrion throughout the area, year-round or during annual migrations.

Riparian associated species including warblers, flycatchers, and sparrows utilize shrub and tree dominated habitat along Little Willow and Big Willow creeks for nesting, brood rearing, and foraging. Little Willow Creek provides marginal quality habitat that is substantially influenced by agricultural activities and is primarily characterized by herbaceous-dominated vegetation with scattered stands of cottonwood, willow, and Russian olive. Big Willow Creek provides good quality habitat that is characterized by a fairly contiguous cottonwood overstory with interspersed willow and herbaceous communities or understories.
Resident (e.g., golden eagle, red-tailed hawk, Cooper's hawk) and migratory (e.g., burrowing owl, short-eared owl, prairie falcon) birds use the area for nesting, brood rearing, foraging, and migration. Surveys for raptor nests have not occurred in or adjacent to the lease parcels. Although fires have degraded much of the habitat, it does provide suitable habitat for a variety of prey species including small mammals, song birds, reptiles, and insects.

<u>Burrowing Mammals</u>
Southern Idaho Ground Squirrel - Southern Idaho ground squirrels inhabit drainage bottoms and adjacent gradual slopes in small scattered populations, below approximately 3,200 feet elevation. Historically, SIDGS primarily occupied sandier soils that supported big sagebrush/bunchgrass/forb communities with antelope bitterbrush (Yensen 1991). In the absence of a reliable and nutritious diet provided by native grasses and forbs, SIDGS are subject to the highly variable productivity and nutritional value of exotic annuals. When annual precipitation is relatively low, poor productivity of exotic annuals may not provide enough nutritional sustenance to enable squirrels to store enough fat to survive their long over-wintering period (torpor). The availability of forbs plays a crucial role in the torpor persistence of juvenile male ground squirrels (Barrett 2005). Torpor begins in late June or early July when vegetation begins to dehydrate and desiccate, and lasts until late January or early February when squirrels emerge from their burrows.

Currently, SIDGS habitat is dominated by exotic annuals and provides limited sagebrush cover with perennial herbaceous understories needed to support a stable squirrel population; medusahead is common throughout the area, especially on south aspects, and is indigestible for

SIDGS due to its high silica content. The majority of known SIDGS colonies occur on adjacent private lands (IDFG 2013). There is a paucity of SIDGS monitoring data for the area, but it is likely that SIDGS utilize habitat on the northerly aspects of public land to some degree, as these areas tend to support more native vegetation.

Pygmy Rabbit - The pygmy rabbit is the smallest North American rabbit species (USFWS 2010). On September 30, 2010, the USFWS concluded that the pygmy rabbit does not currently warrant listing under the ESA (USFWS 2010). This species is typically found in areas of tall, dense sagebrush cover and are considered a sagebrush-obligate species because they are highly dependent on sagebrush to provide both food and shelter throughout the year (Green and Flinders 1980; Katzner and Parker 1997). Pygmy rabbits have been found from 2,900 feet to over 6,000 feet in elevation in southwestern Idaho. Although low sagebrush density and prevalence of cheatgrass provides marginal habitat, pygmy rabbits have been observed in the proposed lease area.

<u>Big Game</u>
The area provides limited winter habitat for antelope and mule deer as south slopes are typically dominated by annual grasses and do not support adequate shrub cover. Mule deer inhabiting the area are part of the Weiser-McCall Population Management Unit (IDFG 2010b). Deer winter range has been adversely impacted by wildfire, as fire has reduced the abundance of important shrub species such as bitterbrush and sagebrush that deer depend on for food and thermal cover during the winter. The spread of noxious weeds also poses a threat to mule deer winter range. The area may provide marginally better elk winter range because of their grass species dietary preferences even during winter. Elk inhabiting the area are part of the Weiser River Zone delineated by the Idaho Department of Fish and Game (IDFG). Threats to elk winter range habitat include noxious weed invasion such as yellow starthistle and whitetop (IDFG 2010a). Big game may avoid the area during late summer, fall, and winter due to lack of shrub cover on southerly slopes, reduced abundance of perennial grasses and forbs, and off-highway vehicle (OHV) activity. The proposed lease area occurs on the western edge of identified winter range and is characterized by regular human disturbance associated with low density rural residences and associated agricultural activities. Approximately 77% of the proposed lease area and 94% of lands associated with federal mineral reserves are considered big game winter range (Map 6).

<u>Aquatic Species</u>
Perennial and intermittent water sources provide breeding and brood-rearing habitat for a variety of amphibian, reptile, and fish species. Degraded water quality (e.g., increased temperature levels, sediment loads, and agricultural pollutants) and irrigation dewatering, especially in Little Willow Creek, may limit the suitability or productivity for some species. Adjacent uplands provide important foraging areas for amphibians and reptiles. Some species (e.g., western toad) may move up to 3.9 miles (1.2 miles on average) from breeding areas and occupy areas away from water sources (Bull 2006).

<u>Bats</u>
Up to 11 special status bat species could occur in the area. The species rely on natural (e.g., tress, cliffs, and caves) or manmade (e.g., buildings) structures for roosting and hibernating.

They are typically nocturnal insect foragers in a variety of habitats including forest, shrub, grass, or agriculture dominated areas. Little brown bats typically forage up to 0.6 miles from a roost area; however, ranges diminish to predominantly 0.1 miles in July when females are lactating and insect densities are high (Henry et. al. 2002).

3.6.2 Environmental Consequences – Wildlife/Special Status Animals

Impacts to wildlife are based on the RFDS created for this document (Table 2, Appendix 1).

3.6.2.1 General Discussion of Impacts

The use of standard lease terms and stipulations could minimize, but not preclude impacts to wildlife. Oil and gas development which results in surface disturbance could directly and indirectly impact aquatic and terrestrial wildlife species. The scale, location, and pace of development, combined with implementation of mitigation measures and the specific tolerance of the species to human disturbance all influence the severity of impacts to wildlife species and habitats.

Direct impacts would include disturbance or interruption of activities, vehicle collisions, powerline collisions and electrocutions, nest abandonment, habitat avoidance, displacement of wildlife species resulting from human presence and increased predation. Disturbances (e.g., natural gas development activities, OHV use) can adversely affect songbird habitat use (Ingelfinger 2001; Barton and Holmes 2007). The impacts were greatest within 330 feet of high traffic volume roads where $\leq$60% population reductions occurred even when traffic volumes were less than 12 vehicles/day. Noise and human activities can disrupt key activities such as breeding displays, brooding, and foraging. Road mortality can be influenced by travel speed, species abundance, species susceptibility, coincidence of vehicle and animal activity, and proximity to key habitats. Hawks and owls are more susceptible to electrocution especially where wingspans are wider than the line spacing, whereas quail, pheasants, ducks, and songbirds are more susceptible to collision hazards (Bevanger 1998).

Indirect impacts would include loss or reduction in suitability of habitat, improved habitat for undesirable (non-native) competitors, species or community shift to species or communities more tolerant of disturbances, barriers to species migration and dispersal, and habitat fragmentation. Increases in invasive and noxious weed species that displace native plant species would adversely affect habitat structure and quality, reducing habitat suitability for most species while favoring species that tolerate poor habitat quality.

<u>Migratory Birds and Raptors</u>

Construction and development activities can effect migratory bird’s nesting season from as early as February 15; however, activity from March 15th through August 15th poses the greatest impact to migratory birds by disrupting breeding behavior and breeding success. Nest occupancy for some species (e.g., golden eagle and ferruginous hawk) may not be affected during the production phase (Wallace 2014). Response to disturbances during winter, when birds are stressed by environmental conditions could adversely affect survivability. During the winter, 97% of raptors flushed when humans on foot were within 385 feet and 38% flushed when vehicles were within 245 feet (Holmes et. al. 1993). Take of bald and golden eagles or any other migratory species would not be anticipated; however, take may occur indirectly as a result of vehicle collisions and other related actions associated with development.

Burrowing Mammals
Construction of well pads and roads could directly eliminate habitat. Vehicle traffic and increased raptor perch sites associated with powerlines and other infrastructure would increase mortality. Reduced habitat quality (e.g., increases in invasive annuals and noxious weeds) and increased fragmentation would adversely affect SIDGS annual body condition, survival rates, and population viability (Barrett 2005) and pygmy rabbit diet quality and cover (Larrucea and Brussard 2008).

Big Game
Well pad and road construction would reduce available habitat. Roads and associated disturbances would reduce suitability of adjacent habitat. Short and long-term responses to development and production activities vary by species and habitat type (Hebblewhite 2008). Mule deer avoided areas when development was initiated and did not become acclimated to activities as time passed; instead, avoidance distances increased as development progressed (Sawyer et. al. 2006). The distance animals were displaced increased from 1.7 to 2.3 miles away from well pads during the first three years of development. Mule deer densities decreased 46% in the developed area over a four year period. Animals forced to winter at higher elevations with increased snow levels would have reduced survival rates. Habitat loss and fragmentation were better predictors of antelope winter habitat use than distance to well pads and roads (Beckman et. al. 2008). In areas with relatively limited pre-development disturbance, major ungulate responses (e.g., avoidance or abandonment) could occur when oil and gas development of 0.3–1.3 wells/mi^2 and 0.3-1.6 linear road miles/mi^2 occurred (Hebblewhite 2008).

Aquatic Species
Noise and lights from development activities could disrupt breeding behavior annually. Road mortality would affect species that spend part of their life cycle in terrestrial habitats (Carr 2002). Pollutants discharged into aquatic systems could cause behavioral changes, mutations, or mortality at all life stages (Lefcort et. al. 1998).

Bats
Lights and noise associated with human activities could cause short-term disruptions in foraging behavior and success. Persistent disturbances near roost sites could cause avoidance or abandonment. Bat responses to disturbances vary by species, and some species (e.g., big brown bat) may be more tolerant than others (Duchamp et. al. 2004). Infrastructure (e.g., powerlines) could cause increased collision mortality. Actions that reduce insect productivity (e.g., reduced habitat quality, pollutants) would reduce available prey.

3.6.2.2 Alternative A

Migratory Birds and Raptors
Development of two wells and associated infrastructure would have minor adverse short- and long-term disturbance, mortality, and habitat quality reduction impacts. An additional 0.5 miles

of roads would cause a negligible increase in fragmentation and disturbance. Low levels of localized disturbance would occur throughout the year over the long term. Up to 7 acres of habitat would be directly eliminated and use would be reduced on 70 acres because of disturbance.

Burrowing Mammals

Development of two wells and associated infrastructure would have minor adverse short- and long-term mortality and habitat quality reduction impacts. An additional 0.5 miles of roads and powerlines would cause a minor increase in SIDGS mortality. Up to 7 acres of habitat would be directly eliminated. Depending on the location of roads and well pads, impacts to pygmy rabbits could be negligible (development >0.35 miles from sagebrush) to major (development in an occupied sagebrush stand).

Big Game

Depending on their location and animal responses, development of two wells and associated infrastructure would have minor (wells adjacent to existing disturbances that animals have become habituated to) to major (at least one well on the east side of the lease area that effectively keeps animals from using the remainder of the lease area) disturbance impacts. Changes in habitat fragmentation (beyond the disturbance component) and habitat quality would have minor adverse long-term impacts. Animals habituated to low levels of disturbance could be displaced to adjacent agricultural areas over the short term when moderate or greater development disturbances occur during winter use periods.

Aquatic Species

Depending on their location, development of two wells and associated infrastructure would have negligible (>0.5 miles from wetland/riparian habitat with no possibility of pollution input) to moderate (<0.1 miles from wetland/riparian habitat with potential pollution input) disturbance and pollutant impacts.

Bats

Development of two wells and associated infrastructure would have negligible (located >0.75 miles from roost sites) to minor (located <0.5 miles from roost sites) adverse short- and long-term disturbance, mortality, and prey reduction impacts.

3.6.2.3 Alternative B

No direct habitat loss (77 acres of well pads and roads) would occur on the 6,349 acre federal mineral estate until the FRMP was implemented; however, loss could occur in adjacent areas that are developed prior to FRMP implementation. Stipulations derived from the FRMP could help mitigate impacts described below.

Migratory Birds and Raptors

Development of 22 wells and associated infrastructure would have moderate to major adverse short- and long-term disturbance, mortality, and habitat quality reduction impacts. An additional 5.5 miles of roads would cause a major increase in fragmentation and disturbance because regular activity would occur in most of the proposed lease area. Moderate levels of disturbance would occur throughout the year and lease area over the long term. Up to 77 acres of habitat would be directly eliminated and use would be reduced on 770 acres because of disturbance.

Burrowing Mammals

Development of 22 wells and associated infrastructure would have moderate to major adverse short- and long-term mortality and habitat quality reduction impacts. An additional 5.5 miles of roads and powerlines would cause minor to moderate increases in SIDGS mortality. Up to 77 acres of habitat could be directly eliminated. Habitat quality changes would adversely affect both species; however, impacts to pygmy rabbits would be greater because of their year-round activity patterns.   Depending on the location of roads and well pads, impacts to pygmy rabbits could be negligible (development >0.35 miles from sagebrush) to major (development in an occupied sagebrush stand).

Big Game

Development of 22 wells (1 well/mi^2) and associated infrastructure would have moderate to major adverse short- and long-term disturbance, habitat fragmentation, and habitat quality reduction impacts. Road densities would increase to 1.7 miles/mi^2, but vehicle traffic throughout the area would increase substantially, especially during the development phase. Existing unmaintained roads would be upgraded and become potentially more accessible throughout the year and to a greater number of users, increasing disturbance and fragmentation. Access restrictions by private landowner could limit disturbances to development and production activities. The activities would make the area unsuitable winter range for animals that do not become habituated to higher disturbance levels. Animals habituated to low levels of disturbance could be displaced to adjacent agricultural areas over the short and long (until development is completed) term when moderate or greater development disturbances occur during winter use periods. Increases in invasive and noxious weed species would further degrade habitat; however, improved access that helps fire suppression efforts could reduce fire size and associated habitat loss.

Aquatic Species

Development of 22 wells and associated roads would have minor to moderate adverse short- and long-term disturbance, mortality, and pollutant impacts. Ponds and streams downslope from well pads would be most susceptible to surface-flow pollutant impacts. Contaminated ground water that connects to streams could have negligible (short-term, non-toxic pollutants) to major (persistent toxicant introduced) adverse impacts on up to 5.8 miles of perennial streams in the proposed lease area and potentially downstream areas.

Bats

Development of 22 wells and associated infrastructure would have minor (disturbance located >0.75 miles from roost sites) to moderate (located <0.5 miles from roost sites) adverse short- and long-term disturbance, mortality, and prey reduction impacts. Disturbance tolerant species would be less affected than intolerant species. Reduced insect production associated with decreased habitat quality would adversely affect all species over the long term.

3.6.2.4 Alternative C

Migratory Birds and Raptors

Development of 25 wells and associated infrastructure would have similar disturbance, mortality, and habitat quality reduction impacts as described in Alternative B (Section 3.6.2.3). An additional 6.8 miles of roads would cause a major increase in fragmentation because roads would occur throughout the lease area. Up to 88 acres of habitat would be directly eliminated and use would be reduced on 875 acres because of disturbance. Winter and spring surface use restrictions would reduce or eliminate lessee-related disturbance and mortality impacts during critical periods; however, increased access by non-lessee users could offset those benefits. No surface occupancy within 0.5 miles of heron rookeries would minimize lessee-related disturbances and habitat impacts.

Burrowing Mammals

Development of 25 wells (1 well/mi^2) and associated infrastructure would have moderate adverse short- and long-term mortality and habitat quality reduction impacts. An additional 6.8 miles of roads and powerlines would cause minor to moderate increases in SIDGS mortality. Avoidance of burrow sites would eliminate direct impacts to those important areas, but up to 88 acres of foraging habitat could be eliminated and infrastructure that increases disturbance and raptor perch sites could adversely affect adjacent burrow sites. Habitat quality change impacts would be as described in Alternative B (Section 3.6.2.3). Controlled surface use restrictions would benefit burrowing mammals that occur in restricted areas by reducing (winter and spring restrictions that coincide with critical periods of pygmy rabbits) or eliminating (spring restrictions that coincide with SIDGS active periods) lessee-related disturbances.

Big Game

Development of 25 wells and associated infrastructure would have moderate to major adverse short- and long-term disturbance, habitat fragmentation, and habitat quality reduction impacts. Road densities would increase to 1.8 miles/mi^2, but controlled surface use restrictions would reduce or eliminate lessee-related disturbances during the winter. If exceptions are granted to surface use restrictions, then disturbances from development and production activities could have minor (1-2 one-day exceptions during the course of a winter) to major (exceptions throughout the winter) short and long terms impacts similar to those described in Alternative B (Section 3.6.2.3). If exceptions are minimalized, animals would be less likely to move to adjacent agricultural lands (as described in Alternative B, Section 3.6.2.3). Other road-related and habitat quality impacts would be as described in Alternative B (Section 3.6.2.3). Overall winter range suitability could be similar to Alternative B or slightly improved depending on how animals respond to infrastructure and wells despite surface use restrictions.

Aquatic Species

Surface occupancy and pollutant restrictions would minimize or eliminate development and production related disturbance, mortality, and pollutant impacts to key aquatic habitat. Development of 25 wells and associated roads would have minor to moderate adverse short- and long-term disturbance and mortality impacts to species that utilize areas >500 feet from riparian habitats.

Bats

Development of 25 wells and associated infrastructure would have similar disturbance, mortality, and prey reduction impacts described in Alternative B (Section 3.6.2.3). Spring controlled surface use restrictions and riparian habitat buffers would benefit bats by reducing or eliminating activities in important foraging and roosting areas.

3.6.3 Mitigation

Measures would be taken to prevent, minimize, or mitigate impacts to terrestrial and aquatic species from exploration and development activities. Lease stipulations to mitigate impacts on wildlife would be placed on leases for crucial winter range (timing limitation), migratory birds and raptors (controlled surface use), burrowing mammals (lease notice), Endangered Species Act (Section 7 Consultation), and fragile soils (lease notice) stipulations which would protect additional habitat. Prior to authorization, activities would be evaluated on a case-by-case basis, and the project could be subject to additional mitigative COAs. Mitigation could include rapid revegetation, project relocation (<660 feet), or pre-disturbance wildlife species surveying. If oil and gas development is proposed in suitable habitat for threatened or endangered species, consultation with the USFWS would occur to determine if additional terms and conditions would need to be applied. Adherence to Avian Powerline Interaction Committee (APLIC) guidelines could help reduce or eliminate electrocution mortality.

The following operational measures would help reduce wildlife impacts. If drilling operations require evaporation ponds, cover ponds with nets to exclude migratory birds. Ponds should be checked frequently (daily) for trapped wildlife. Report trapped wildlife (live and dead) to BLM, FWS, and IDFG no later than 24 hours of initial discovery. Lighting at sites should be directed specifically to where needed to minimize potential impacts to wildlife and turned off when not in use. To minimize predators or nuisance wildlife at work sites, place an appropriately sized dumpster with lid at each site during construction activities and check/dump as needed. Prohibit workers from bringing dogs to well sites during drilling and site maintenance actions to avoid predation/harassment of wildlife. Enforce speed limits of 25 MPH on spur roads and well pads to reduce wildlife collision risk.

3.6.4 Cumulative Impacts - Wildlife/Special Status Animals

Cumulative impacts to wildlife are based on the RFDS created for this document (Appendix 1) and the actions discussed below.

3.6.4.1 Scope of Analysis

The 81,518-acre CIAA (13% BLM, 4% State, and 83% private) includes a 3-mile buffer around the proposed lease area and north of the Payette River (Map 6). This area was selected because it corresponds to typical foraging or dispersal movements or disturbance response distances for a variety of species. The lease period of 10 years will be used for the temporal analysis limit because most disturbance impacts are associated with lease activities and site reclamation would address some longer term impacts such as habitat quality and fragmentation.

3.6.4.2 Current Conditions and Effects of Past and Present Actions

The CIAA supports the same species described above. Migratory birds and raptors are common throughout the area. Pygmy rabbits are uncommon and SIDGS are present throughout most of the area. About 60% of the area, primarily in the north and east, is considered big game winter range. Approximately 36 miles of perennial streams and river provide marginal to suitable habitat for aquatic species.

Vegetative Cover and Habitat Conditions – Sagebrush and other shrubs (26,809 acres; 33% of CIAA), exotic annuals (29,807 acres; 37%), agriculture/urban (16,531 acres; 20%), and perennial bunchgrass (7,936 acres; 10%) comprise the majority of cover types. Sagebrush understory conditions vary by slope and aspect, with steeper and north facing slopes generally having a more intact native understory than gentler and south facing slopes. Approximately 79% of the area has burned one or more times, with most of the fires occurring during the 1980s. Where shrubs have become re-established in areas burned prior to 1990, exotic annuals are dominant or co-dominant in the understory. Conditions on the Little Willow (14 miles) and Big Willow (11.8 miles) creeks are similar to those described above. The Payette River (9.8 miles) is characterized by cottonwood and willow overstories with shrub and herbaceous understories.

Disturbance – The CIAA is characterized by low density rural development. Disturbance factors include agricultural activities, OHV use, hunting, and other recreational uses. Nonresident access is restricted in much of the CIAA by private landowners. Recreational use is greatest during the spring and fall.

Roads – There are approximately 197 miles of roads (1.5 miles/mi^2) including 9.3 miles of highway, 45 miles of maintained roads, and 142.7 miles of unmaintained roads. The majority of maintained roads are associated with developed areas on Little Willow and Big Willow creeks or the Payette River. There are 9 miles of designated trails east of the Big Willow and Stone Quarry roads junction. Within big game winter range, approximately 1,172 acres are designated as closed to motorized vehicles, 127 acres are designated as open, and the remainder are designated limited to existing roads.

Powerlines - The CIAA includes two transmission lines (26.5 miles) and numerous distribution lines (74.7 miles). Transmission lines are built to APLIC standards; however, most distribution lines are not. Therefore, both types represent collision hazards, but only the distribution lines represent electrocution hazards. The majority of distribution lines are within 0.3 miles of Little Willow and Big Willow creeks or the Payette River.

Livestock Grazing – The CIAA includes all or portions of 10 BLM-administered livestock grazing allotments (32,550 acres; 40% of CIAA). The allotments are used primarily during the spring, with some season long (e.g., Kauffman) or winter (e.g., Sand Hollow) use occurring. Undeveloped private lands outside BLM allotments and agricultural fields (fall-winter) are also used for grazing.

3.6.4.3 Reasonably Foreseeable Future Actions

Oil and Gas Lease Development and Production – There are 11 existing or planned wells (Map 1, IOGCC 2014). There are approximately 4,960 acres of State-managed mineral resources, some of which have been leased, but drilling has not been initiated. Exploration is currently being conducted in the eastern two-thirds of the CIAA. Approximately 15 wells could be drilled in the Willow Field between the Payette River and the proposed lease area.

Agricultural/Residential Development – Development causes a direct loss of wildlife habitat and activities associated with the developed areas can cause disturbance over the long term. Limited residential development would occur on the western boundary of the CIAA. Negligible increases in agricultural development would be expected because of limited water resources. If water resources decline, some fields could go fallow, creating marginal wildlife habitat. New development would require additional powerlines and other infrastructure.

Recreation Uses – Off-highway vehicle use would be expected to remain static (e.g., increased access restrictions imposed by private landowners) or increase (e.g., in response to increasing populations) over time. Approximately 384 acres along the Payette River are managed by the IDFG in the Payette River Wildlife Management Area to benefit wildlife and sportsmen.

Wildfire – Although not planned events, wildfires would be expected to periodically occur and may increase in size and frequency in response to climate change. Loss of shrubs and increased dominance of exotic annuals in burned areas would reduce habitat structure and quality over the short term. Adverse effects would persist over the long term where native perennials don't re-establish.

3.6.4.4 Alternative A – Cumulative Impacts

Two additional wells and associated infrastructure would have negligible additive disturbance, mortality, habitat quality reduction, and fragmentation impacts over the short and long term. Ongoing activities and existing roads and powerlines would cause minor (away from developed areas) to moderate (adjacent to developed areas along Little Willow and Big Willow creeks) disturbance and mortality impacts throughout the CIAA. Livestock grazing, especially in consistent spring use areas, would favor exotic annuals and early seral native and non-native species throughout undeveloped portions of the CIAA. Development and production activities of at least 26 wells would have moderate disturbance, mortality, and fragmentation impacts over the short and long term on approximately 20% of the CIAA. The majority of wells would be within 0.5 miles of perennial streams, but only nine wells would be within 1.5 miles of big game winter range. Additional agricultural and residential development would have minor disturbance, habitat loss, and fragmentation impacts over the long term. Depending on size, wildfires would have minor to major long-term adverse impacts on habitat quality and fragmentation.

3.6.4.5 Alternatives B and C – Cumulative Impacts

Development and production activities at 22 to 25 wells in the proposed lease area would have moderate additive disturbance, mortality, habitat quality reduction, and fragmentation impacts over the short and long term. Timing and other restrictions in Alternative C wells would help reduce spatial and temporal overlap with other disturbances (e.g., other oil and gas development, recreation use) and habitat quality and fragmentation impacts. Impacts from ongoing and foreseeable future actions would be as described in Alternative A (Section 3.6.4.4).

3.7 Cultural Resources

3.7.1 Affected Environment – Cultural Resources

The BLM is responsible for identifying, protecting, managing, and enhancing cultural resources which are located on public lands, or that may be affected by BLM undertakings on non-Federal lands, in accordance with the National Historic Preservation Act (NHPA) of 1966, as amended. The procedures for compliance with the NHPA are outlined in regulation under 36 CFR 800. Cultural resources include archaeological, historic, and architectural properties, as well as traditional life-way values and/or traditional cultural properties important to Native American groups.

Common prehistoric archaeological site types in Payette County include rock art, artifact scatters, burials, and tool manufacture. Common historic archaeological sites are the remains of farmsteads, homesteads, depressions, artifact scatters, foundations, cabins, sheepherder camps, and historic inscriptions.

A literature search (Level I or Class I) of Idaho State Historic Preservation Office records and a 2001 Class III survey (498 acres associated with Idaho Power right-of-way) identified 11 sites within a one-mile search radius. Records were reviewed to determine what types and numbers of known cultural resources are present within or adjacent to the lease area. Seven sites are prehistoric, three sites are historic, and one site includes prehistoric and historic artifacts. None of the sites were considered eligible for listing on the National Register of Historic Places (NRHP).

3.7.2 Environmental Consequences – Cultural Resources

Impacts to cultural resources are based on the RFDS created for this document (Table 2, Appendix 1).

3.7.2.1 General Discussion of Impacts

Ground disturbing activities could alter the characteristics of an eligible property by diminishing the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Other effects to cultural resources from surface disturbance activities include the destruction, damage, or alteration to all or part of the cultural resource and diminishing the property’s significant historic features as a result of the introduction of visual, atmospheric, or audible elements. Activities that adversely affect adjacent vegetation conditions and soil stability could increase erosion that would degrade or destroy site context.

3.7.2.2 Alternative A
Development of two wells and associated infrastructure could adversely affect cultural resources on private lands.

3.7.2.3 Alternative B
Leasing with a NSO stipulation would preclude ground disturbing impacts to cultural resources on 6,349 acres. Changes in vegetation condition and erosion could have negligible long-term impacts for eligible properties adjacent to ground disturbing activities.

3.7.2.4 Alternative C
Compliance with Cultural Resources S-2 would ensure that no sites would be disturbed or destroyed before they are inventoried and evaluated for eligibility for listing in the NRHP. Historic and archeological sites that are eligible for listing in the National Register of Historic Places or potentially eligible to be listed would either be avoided or have the information in the sites extracted through archeological data recovery prior to surface disturbance.

3.7.3 Mitigation
Specific mitigation measures including site avoidance, excavation, or data recovery would have to be determined when site-specific development proposals are received. Most surface-disturbing situations for cultural resources would be avoided by project redesign or relocation. Unavoidable, significant properties would be site-specifically mitigated with concurrence with the State Historic Preservation Office prior to implementation of a project.

3.7.4 Cumulative Impacts – Cultural Resources
Because the alternatives would cause none to negligible impacts to cultural resources, cumulative impacts will not be discussed.

3.8 Paleontological Resources

3.8.1 Affected Environment – Paleontological Resources
According to Section 6301 of the Paleontological Resource Protection Act of 2009 Omnibus Public Lands Bill, Subtitle D, SEC. 6301, paleontological resources are defined as “any fossilized remains, traces, or imprints of organisms, preserved in or on the earth’s crust, that are of paleontological interest and that provide information about the history of life on earth” (Paleontological Resource Protection Act of 2009 Omnibus Lands Bill, Subtitle D, SEC. 6301-3612 (P.L. 59-209; 34 Stat. 225; 16 U.S.C. 431-433). Significant fossils are defined by BLM policy as including all vertebrate fossil remains and those plant and invertebrate fossils determined to be scientifically unique, on a case-by-case basis. Paleontological resources do not include archaeological and cultural resources.

The proposed lease area includes Miocene (sedimentary rocks associated with flood basalts; 5-23 million years BP) and Pleistocene and Pliocene (older sediments and sedimentary rocks, gravel, sand, and silt deposited in fans; 11,700 to 5.3 million years BP) epochs, and Quaternary (alluvial gravel, sand, and silt deposits associated with Little and Big Willow creeks; 0-2.6 million years

BP) period deposits. Paleontological surveys have not been conducted in the proposed lease area; however, a diversity of fossiliferous resources could be expected to occur and fossilized remains of horse, beaver, camel, and elephant-like animals have been found in the Glenns Ferry Formation (Erasthem-Vanir 2009).

The BLM utilizes the Potential Fossil Yield Classification (PFYC) as a planning tool for identifying areas with high potential to yield significant fossils. The system consists of numbers ranging from 1-5 (low to high) assigned to geological units, with 1 being low potential and 5 being high potential to have significant fossil resources. The potential to yield significant fossil resources is never 0. It is anticipated that most significant fossil resources are located in those geologic units with a PFYC of 3 or greater. However, significant fossil resources could be discovered anywhere. Rock units not typically fossiliferous can in fact contain fossils in unique circumstances.

The BLM classified geologic formations that have a high Potential Fossil Yield Classification (PFYC) of 3 or higher should be specifically reviewed for paleontological resources. Much of the proposed lease area falls within the Glenns Ferry Formation which has a Class 5 PFYC and should be evaluated for fossil resources before and potentially during ground-disturbing activities.

3.8.2 Environmental Consequences – Paleontological Resources

Impacts to paleontological resources are based on the RFDS created for this document (Table 2, Appendix 1). The analysis assumes that surveys conducted prior to ground disturbing activities would identify paleontological resources on the surface (see CSU 12 and LN 7).

3.8.2.1 General Discussion of Impacts

Surface-disturbing activities could potentially alter the characteristics of paleontological resources through damage, fossil destruction, or disturbance of the stratigraphic context in which paleontological resources are located, resulting in the loss of important scientific data. Identified paleontological resources could be avoided by project redesign or relocation before project approval which would negate the need for the implementation of mitigation measures. Increased public access could result in vandalism or collection of paleontological resources. Conversely, surface-disturbing activities could potentially lead to the discovery of paleontological localities that would otherwise remain undiscovered due to burial or omission during review inventories. The scientific retrieval and study of these newly discovered resources would expand our understanding of past life and environments of Idaho.

3.8.2.2 Alternative A

Infrastructure development associated with two wells could directly impact paleontological resources on up to 7 acres on private lands. Increased public access could expose areas surrounding new roads to negligible to minor vandalism or collection impacts.

3.8.2.3 Alternative B

Infrastructure associated with 22 wells would not occur on 6,349 acres of BLM-administered and split estate lands; therefore, there would be no direct impacts to paleontological resources in these areas. Direct impacts could occur on up to 77 acres of private lands where development does occur. Increased access could have negligible (private landowners restrict public access) to moderate (access is not restricted) vandalism and collection impacts.

3.8.2.4 Alternative C

Infrastructure development associated with 25 wells could directly affect up to 88 acres; however, identification and avoidance or documentation/collection would minimize these impacts. Impacts from increased access would be as described in Alternative B (Section 3.8.2.3).

3.8.3 Mitigation

The application of lease terms, the paleontological conditional surface use stipulation (CSU 11), and the paleontological lease notice (LN 7) at leasing, provides protection to paleontological resources during development. The paleontological lease notice is applied to all lease parcels, requiring a field survey prior to surface disturbance. These survey requirements could result in the identification of paleontological resources. Avoidance of significant paleontological resources or implementation of mitigation prior to surface disturbance would protect paleontological resources.

However, the application of lease terms only allows the relocation of activities up to 200 meters, unless otherwise documented in the NEPA document, and cannot result in moving the activity off lease. Specific mitigation measures could include, but are not limited to, site avoidance or excavation. Avoidance of paleontological properties would be a best management practice. However, should a paleontological locality be unavoidable, significant fossil resources must be mitigated prior to implementation of a project. These mitigation measures and contingencies would be determined when site specific development proposals are received.

3.8.4 Cumulative Impacts – Paleontological Resources

Because paleontological resource impacts would be avoided or mitigated on BLM-administered and split estate lands, cumulative impacts will not be discussed.

3.9 Recreation

3.9.1 Affected Environment – Recreation

BLM only manages recreational opportunities and experiences on BLM-administered surface lands. Recreational activities enjoyed by the public on BLM lands in the proposed lease area include hunting, hiking, and OHV activities. Benefits and experiences enjoyed by recreational users include opportunities for solitude, spending time with families, enhancing leisure time, improving sports skills, enjoying nature, and enjoying physical exercise. The 997 acres of BLM-administered lands proposed for lease have limited legal public access (i.e., no public easements or rights-of-way across private property). The lack of public access limits use of the BLM parcels for recreational use by the general public. None of the BLM-administered lands occur in special recreation management areas (SRMAs) or recreation areas. Motorized use on BLM-administered lands is limited to existing roads and trails.

3.9.2 Environmental Consequences – Recreation

Impacts to recreation are based on the RFDS created for this document (Table 2, Appendix 1).

3.9.2.1 General Discussion of Impacts

Road construction that leads to or across BLM-administered lands would create or improve public access to those lands. However, access across private lands between public rights-of-way and public lands would still be at the discretion of the landowner. Noise and traffic associated with development and production could detract from the rural physical and social setting or disrupt some activities (e.g., hunting).

3.9.2.2 Alternative A

Infrastructure development associated with two wells would create none to negligible increases in BLM-administered land access. Public lands would be beyond the potential well sites; therefore, no new roads would be constructed to BLM-administered lands. Development and production activities would cause negligible adverse changes in user experiences.

3.9.2.3 Alternative B

Infrastructure associated with 22 wells would not occur on 6,349 acres of BLM-administered and split estate lands; therefore, there would be none to negligible increases in BLM-administered land access. Development and production activities would cause minor to moderate (e.g., activities adversely affect game species) adverse changes in user experiences.

3.9.2.4 Alternative C

Infrastructure development associated with 25 wells would create minor improvements in BLM-administered land access. Most BLM parcels have existing road access; therefore, upgrading those roads could allow better year-round access by a wider range of users. Development and production activities could cause minor to moderate (e.g., activities adversely affect game species) adverse changes in user experiences.

3.9.3 Mitigation

Because of the isolated nature of public lands in the area, no mitigation would be required.

3.9.4 Cumulative Impacts - Recreation

Because the alternatives would cause primarily none to minor impacts to recreation activities and experiences and public land access is at the discretion of private landowners, cumulative impacts will not be discussed.

3.10 Visual Resources Management

3.10.1 Affected Environment – Visual Resources Management
Visual Resource Management (VRM) is the system used to designate and manage the visual resources on public land. In the lease area, the CRMP designated 112 acres as Class III and 885 acres as Class IV (Map 7). A Class III VRM area classification means the level of change to the character of the landscape should be moderate. Changes caused by management activities should not dominate the view of the casual observer and should not detract from the existing landscape features. Any changes made should repeat the basic elements found in the natural landscape such as form, line, color and texture. A Class IV VRM area classification means that the characteristic landscape can provide for major modification of the landscape. The level of change in the basic landscape elements can be high. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements. An existing 230 kV line traverses Class III and IV lands in the northern portion of the proposed lease area. Human influences are relatively unnoticeable on the remainder of BLM-administered lands that are characterized by mixed vegetation communities, fencing, and unimproved two-track roads.

3.10.2 Environmental Consequences – Visual Resources Management
Impacts to visual resources are based on the RFDS created for this document (Table 2, Appendix 1).

3.10.2.1 General Discussion of Impacts
Disturbance of existing vegetation and creation of permanent linear (e.g., roads, powerlines) and point (e.g., well pads and structures) features would alter the form, line, color, and texture of the natural landscape.

3.10.2.2 Alternative A
Development of two wells on private lands would have no impact on VRM characteristics.

3.10.2.3 Alternative B
Development of 22 wells on private lands would have no impact on VRM characteristics.

3.10.2.4 Alternative C
Development of wells and associated infrastructure on BLM-administered lands could have negligible (Class IV) to minor (Class III) adverse impacts on visual resources. It would introduce more noticeable man-made structures to the natural environment.

3.10.3 Mitigation
All oil and gas development would implement, as appropriate for the site, BLM BMPs for VRM, regardless of the VRM class. This includes, but would not be limited to, proper site selection, reduction of visibility, minimizing disturbance, selecting color(s)/color schemes that blend with the background and reclaiming areas that are not in active use. Repetition of form, line, color and texture when designing projects would reduce contrasts between landscape and development. Wherever practical, no new development would be allowed on ridges. Overall, the goal would be to not reduce the scenic values that currently exist.

3.10.4 Cumulative Impacts – Visual Resources Management

Because the changes associated with the potential development would be in conformance with VRM guidance for Class III and IV lands, cumulative impacts will not be discussed.

3.11 Lands and Realty

3.11.1 Affected Environment – Lands and Realty

Lands and realty actions will only occur on BLM-administered surface lands. The affected environment consists of 997 acres of BLM-administered public lands (or 16% of the total acreage proposed for lease). Rights-of-way currently exist for an Idaho Power 230-kV powerline (IDI-13054; 0.53 miles long by 100 feet wide; 6.4 acres) and associated access roads (1.71 miles of roads 14 feet wide; 2.9 acres) and for the Little Willow Irrigation District's Nelson Canal (IDB-0019666; 0.12 miles) (Map 7).

3.11.2 Environmental Consequences – Lands and Realty

3.11.2.1 General Discussion of Impacts

Standard oil and gas lease terms recognize prior existing rights. Development activities could require rights-of-way that overlay and adversely affect existing rights-of-way. Rights-of-way applications would be analyzed through a NEPA process that would identify potential resource impacts which would likely be similar to impacts described in this document.

3.11.2.2 Alternative A

Development of two wells and associated infrastructure would not affect existing public lands or rights-of-way. The IDI-13054 right-of-way is >2 miles north of the proposed well sites.

3.11.2.3 Alternative B

Development of 22 wells and infrastructure outside BLM-administered mineral rights would not directly affect IDI-13054. Activity could occur within a 0.6-mile segment of the powerline corridor that occurs on private lands.

3.11.2.4 Alternative C

Development of 25 wells and associated infrastructure would have a negligible impact on IDI-13054. Roads associated with the right-of-way could be improved and used for oil and gas infrastructure which would improve access to the powerline. The powerline right-of-way occupies <1% of BLM-administered lands and occurs to the north of where infrastructure would likely occur; therefore, it could be readily avoided.

3.11.3 Mitigation

The split estate lease notice would require the lessee to attempt to work with the surface owner through execution of a Surface Use Agreement. A bond would be required, for the benefit of the surface owner, if no agreement was reached. Measures would be taken to avoid disturbance or impacts to existing rights-of-way, in the event of any oil and gas development activities. Any new "off-lease" or third party rights-of-way required across federal surface for exploration and/or development would be subject to lands and realty stipulations to protect other resources as determined by environmental analyses. In order to protect the existing rights-of-way it is recommended that LN-7 be applied to lease parcels associated with IDI-13054 and IDB-0019666.

3.11.4 Cumulative Impacts - Lands and Realty

Because the alternatives would cause no or negligible impacts to the existing rights-of-way, cumulative impacts will not be discussed.

3.12 Livestock Management

3.12.1 Affected Environment – Livestock Management

The proposed lease area includes portions of five BLM-administered grazing allotments (Map 8). The allotments are permitted for cattle and use periods are in the spring, spring through fall, or winter (Table 9). Total allotment sizes range from 1,488 acres (Danke Allotment) to 15,643 acres (Sand Hollow Allotment), with federal mineral estate affecting 306 acres (Sand Hollow Allotment) to 1,095 acres (Danke Allotment) (Table 10). The allotments have several range improvements including fences, stock ponds, wells, and roads (Map 8). Livestock grazing is not currently permitted on 184 acres of BLM-administered lands in the proposed lease area.

Table 9. Permit information for five allotments affected by proposed Little Willow Creek lease, Payette County, Idaho.

Allotment		**Permittee**	**Livestock**		**Season of Use**	**Permitted AUMs**
Name	**Number**		**Kind**	**#**		
Dannke	00084	Larry Dahnke	C	150	4/1 – 5/15	58
Hashagen	00248	Wolfe Ranches	C	112	3/16 – 4/15*	114
Kauffman	00163	Randall Kauffman	C	200	4/1 – 10/10**	25
Rock Quarry Gulch	20131		C	130	4/11-8/10	115
Sand Hollow	00254	Rocky Comfort Cattle Co.	C	1,302	10/26-3/15***	1,509

*Season and numbers are not restricted to those shown above provided overuse and deterioration do not occur to the federal range.
**Livestock numbers will be coordinated between BLM and the Lessee and may vary within the permitted use period, however, AUMs may not be exceeded. Any change to the scheduled use requires prior approval.
***Season and numbers of livestock are not restricted to those shown above provided overuse and deterioration does not occur to the public lands and the use is covered by the OX CRMP.

Table 10. Federal mineral reserve acres by allotment, amount of allotment in lease area, and total allotment size (acres) for five allotments affected by proposed Little Willow Creek lease, Payette County, Idaho.

Allotment	**Federal Mineral Reserve**		**Lease Area**		**Allotment Total**			
	BLM	**Private**	**BLM**	**Private**	**BLM**	**State**	**Private**	**Total**
Dannke	269	826	269	992	496	0	992	1,488
Hashagen	198	743	198	1,619	511	0	1,901	2,412
Kauffman	57	613	57	1,335	67	0	1,770	1,837
Rock Quarry Gulch	217	824	217	1,620	563	0	1,940	2,503
Sand Hollow	59	247	59	669	4,935	603	10,105	15,643

There are 23.1 miles of allotment boundary and 3.5 miles of pasture fencing in the five allotments. Natural or reservoir water sources occur in the Hashagen and Kaufman allotments.

3.12.2 Environmental Consequences – Livestock Management

Impacts to livestock management are based on the RFDS created for this document (Table 2, Appendix 1).

3.12.2.1 General Discussion of Impacts

Standard oil and gas lease terms recognize prior existing rights. Oil and gas development would result in a loss of vegetation for livestock grazing (e.g., direct removal, introduction of unpalatable plant species), decreased vegetation palatability due to fugitive dust, disrupted livestock management practices, increased vehicle collision injuries and mortalities, altered water quality and availability, and decreased grazing capacity (Fowler and Witte 1985). These impacts would vary from short-term impacts to long-term impacts depending on the development level, reclamation success, and the type of vegetation removed.

Oil and gas development activity would reduce BLM's ability to manage livestock grazing while meeting or progressing towards meeting the Idaho Standards of Rangeland Health (USDI 1997). Development and associated disturbances could reduce available forage or alter livestock distribution which could lead to overgrazing or other localized grazing impacts. Construction of roads, especially in areas of rough topography could improve livestock distribution.

3.12.2.2 Alternative A

Development of two wells and associated infrastructure would occur outside and, therefore, would not directly affect BLM-administered allotments. Negligible impacts from fugitive dust could occur.

3.12.2.3 Alternative B

Development of 22 wells and associated infrastructure on private lands would have negligible (Sand Hollow Allotment) to minor (Hashagen and Rock Quarry Gulch allotments) vegetation loss, palatability, collision, and capacity impacts over the short and long term. Approximately 32% of the development could occur in the allotments (2,982 acres of private lands with no split estate minerals in the allotments/9,292 acres in the proposed lease area); therefore, direct habitat loss would occur on approximately 25 acres (7 wells and 1.75 miles of roads). Changes in palatability and desirable species composition adjacent to roads would depend on the amount of dust generated and the distance it travelled. Roads that cross allotment or pasture boundaries could have moderate to major disruption impacts where animals are able to freely move between use areas. Changes in water availability and quality could occur in the Hashagen and Kaufman allotments. Minor adverse rangeland health impacts could occur on BLM-administered lands, primarily in the Danke, Hashagen, and Rock Quarry Gulch allotments where BLM-administered lands make up 21-25% of the allotment within the proposed lease area.

3.12.2.4 Alternative C

Development of 25 wells and associated infrastructure on private lands would have negligible (Sand Hollow Allotment; e.g., no direct impacts, possible dust and disturbance impacts) to moderate (Danke Allotment; e.g., reduced forage capacity caused by increased weeds) vegetation loss, palatability, collision, and capacity impacts over the short and long term. Based on allotment acreages and well spacing, none (Sand Hollow Allotment) to two wells (Danke, Hashagen, and Rock Quarry Gulch allotments) could be developed. Direct loss of vegetation would be $\leq$7 acres in a given allotment and 25 acres total in the five allotments. Impacts to livestock operations, water, and rangeland health would be as described in Alternative B (Section 3.12.2.3).

3.12.3 Mitigation

Measures would be taken to prevent, minimize, or mitigate impacts to livestock grazing from exploration and development activities. Prior to authorization, activities would be evaluated on a case-by-case basis, and the project would be subject to mitigation measures. Mitigation could potentially include controlling livestock movement by maintaining fence line integrity, fencing facilities, installing cattleguards, re-vegetation of disturbed sites, and fugitive dust control.

3.12.4 Cumulative Impacts - Livestock Management

Cumulative impacts to livestock management are based on the RFDS created for this document (Appendix 1) and the actions identified below.

3.12.4.1 Scope of Analysis

The 23,891-acre CIAA includes all lands associated with the five allotments associated with proposed lease (Table 10). Allotments represent an administrative boundary that addresses most components of an individual's livestock operation. Changes in vegetation conditions outside the allotments that could indirectly affect the allotments are discussed in Soils and Vegetation Cumulative Impacts (Section 3.2.4). The lease period of 10 years will be used for the temporal analysis limit because most impacts are associated with lease activities and site reclamation.

3.12.4.2 Current Conditions and Effects of Past and Present Actions

Vegetation Conditions – Major cover types include shrubs (10,793 acres; 45% of CIAA), exotic annuals (9,511 acres; 40%), and perennial grasses (3,512 acres; 15%). Exotic annuals are the dominant cover type in the Danke, Hashagen, and Rock Quarry Gulch (southern portion allotments. All of the Danke, Hashagen, and Rock Quarry Gulch and significant portions of the Sand Hollow and Kaufman allotments burned in the 1980s. Where shrubs have recovered, exotic annuals are dominant or co-dominant with perennial species in the understory. Species composition is the most important palatability influence, with areas dominated by medusahead providing the least palatable forage except during early spring green-up. Rangeland health assessments have not been conducted on the allotments. Consistent moderate or greater livestock use during the growing period would result in downward perennial grass trends and increased exotic annuals. Perennial grasses would be less affected by dormant season use and could be maintained in the absence of other disturbances (e.g., wildfire).

Disturbance – Disturbance impacts include leaving gates open, harassing livestock, and shooting livestock. There are approximately 46 miles of roads in the allotments, but almost all are unimproved 2-tracks that require access through private lands. Non-livestock related use occurs primarily during the spring and fall by OHV users and hunters. There are existing gas wells on the Hashagen (one well) and Kauffman (two wells) allotments. There are approximately 84 miles of allotment and pasture fences.

3.12.4.3 Reasonably Foreseeable Future Actions

Oil and Gas Lease Development and Production – There are approximately 765 acres of State-managed mineral resources (679 acres in Sand Hollow Allotment, 75 acres in Hashagen Allotment, and 5 acres in Dannke Allotment), some of which may have been leased, but drilling has not been initiated. An unknown amount of private land has also been leased. One additional well could be drilled in the Kaufman Allotment and up to seven wells could be drilled in the Sand Hollow Allotment that would not affect federal mineral estate.

Wildfire – Although not planned events, wildfires would be expected to periodically occur and may increase in size and frequency in response to climate change. Conversion of perennial grass understories to exotic annuals in burned areas would reduce forage quality and availability over the long term. Loss of shrub cover would reduce soil moisture and shorten growing periods. Burned public lands are typically rested one or more growing seasons until recovery objectives are met.

3.12.4.4 Alternative A – Cumulative Impacts

Not leasing federal mineral estate would have no additive impacts. Changes in vegetation conditions caused by livestock grazing and wildfires would have moderate to major adverse impacts to livestock forage where exotic annuals replace perennials and rangeland health standards would not be met over the long term. Larger wildfires would have moderate to major short-term adverse impacts to livestock operations where post-fire rest is implemented. Recreation, OHV, and development/production would cause negligible to moderate short-term disturbance impacts. An additional eight wells and associated infrastructure would cause negligible direct forage loss and decreased forage palatability, but could cause minor to moderate decreases in vegetation conditions where increased access and use increased exotic annuals and noxious weeds.

3.12.4.5 Alternatives B and C– Cumulative Impacts

Development and production activities at 7 to 10 wells in the proposed lease area would have minor to moderate additive vegetation condition and disturbance impacts over the short and long term. Impacts from ongoing and foreseeable future actions would be as described in Alternative A (Section 3.12.4.4).

3.13 Minerals (Fluid)

3.13.1 Affected Environment – Minerals (Fluid)

The proposed lease area occurs in the Payette River Valley, at an elevation of between 2,000 and 3,000 feet. It is on the northern edge of the western Snake River Plain, an approximately 40-mile wide, northwest-trending graben structure, filled with sediments of Plio-Pleistocene Lakes Idaho and Bruneau and intercalated basalts. These sediments are referred to as the Idaho Group (Pliocene) and Payette Formation (Miocene). While there is no type section for the Payette Formation, it is described as a thick body of fresh-water and continental sediments, generally made up of ash, clay, shale, and sandstone, with an occasional lignite bed (Buwalda 1923). The sediments are known to contain organic material, including petrified tree stumps, fresh-water shells and mammalian fossils, such as ancestral horses and camels. Strata seen at Payette extend westward across the Snake River for long distances into Oregon. The Payette Formation has been measured at over 4,000 feet in a deep well at Ontario, Oregon.

The Willow and Hamilton fields have been designated by the oil industry to delineate areas believed to have a natural gas reservoir large enough to sustain commercial development (Map 1). Developers describe the reservoir as being a sequence of fluvial sands, ranging from 500 to 800 feet thick, except where replaced/interrupted by volcanics (IOGCC 2013a). In the ML Investments #1-10 well, located in T. 8 N., R. 4 W., Section 10, the fluvial sand was found at 4,100 feet. Another sand layer is described at the 3,750 foot depth. The fluvial sands are porous and have consistent characteristics across the reservoir. They are overlain by 1,700 – 3,500 feet of lacustrine shale, which provides a regional topseal. Both sands are believed to be adequately drained by a well spacing of one well per 640 acres (IOGCC 2013a). The Western Idaho Basin is characterized primarily by conventional non-associated gas; however, conventional associated (with oil) and tight sand gasses may also be present, but shale-associated gas resources are not thought to be present (Johnson et. al. 2013). Conventional non-associated and associated gases typically can be extracted with smaller scale fracking (well-bore stimulation; Johnson et. al. 2013 pg. 8); however, tight sand and shale-associated gases likely would require fracking to extract.

Although BLM had numerous leases in the 1980's in the area, there are no current federal oil and gas leases in Payette County. In 2014, the Idaho Department of Lands (IDL) leased approximately 4,100 acres of State-owned minerals in Payette County. The remainder of the 20,288 acres of State-owned minerals in Payette County were leased between 2006 and 2013. The State currently has approximately 85,000 acres leased for oil and gas development statewide. There are no wells on federal mineral estates in Payette County; however, there is one producing well and 10 shut-in wells pending pipelines located on private lands (Table 11).

Table 11. Existing development activity on federal and State leases, Payette County, Idaho.

Well Type	Federal Estate	Private and State Leases
Drilling Well(s)	0	4
Producing Gas Well(s)	0	1
Shut-in Well(s) (pending pipeline)	0	10
Permitted, not Drilled Well(s)	0	2
Temporarily Abandoned Well(s)	0	1

3.13.2 Environmental Consequences – Minerals (Fluid)

Impacts to minerals are based on the RFDS created for this document (Table 2, Appendix 1).

3.13.2.1 General Discussion of Impacts

Issuing a lease provides the lessee with the exclusive right to explore for and develop oil and gas. Natural gas produced from federal mineral estate would enter the public markets. The production of oil and gas would result in the irreversible and irretrievable loss of these resources. Royalties and taxes would accrue to the federal and state treasuries from the lease parcel lands. There would be a reduction in the known amount of oil and gas resources. If the federal mineral estate is not leased, but is omitted by the Idaho Oil and Gas Conservation Commission (IOGCC), then they could be drained without compensation.

Stipulations applied to various areas with respect to occupancy, timing limitation, and control of surface use could affect oil and gas exploration and development, both on and off the federal parcel. Leases issued with major constraints (NSO stipulations) may decrease some lease values, increase operating costs, and require relocation of well sites, and modification of field development. Leases issued with moderate constraints (timing limitation and controlled surface use stipulations) may result in similar but reduced impacts, and delays in operations and uncertainty on the part of operators regarding restrictions.

3.13.2.2 Alternative A

The federal mineral estate could remain in place over the short and long terms if they were not leased. The two additional wells would occur in privately-owned mineral estate ≥0.5 miles from federal mineral estate. However, if the federal mineral estate were omitted by the IOGCC, then at least 493 acres of the federal mineral estate within 0.5 miles of existing wells (based on 1 well/640 acre spacing) could be drained.

Because of mineral ownership patterns, not leasing 6,349 acres of federal mineral estate could have moderate to major adverse effects on the ability to develop and produce State- and privately-owned fluid minerals. Lease values and operating costs could be adversely affected. Development of non-federal reserve minerals would not be adversely affected if the IOGCC omits the federal mineral estate.

3.13.2.3 Alternative B

The NSO and NSSO stipulations affecting 6,349 acres would cause minor to moderate decreased lease values and increased operating costs. Developing 22 wells on private lands would allow oil and gas production from the majority of federal mineral estate and State- and privately-owned minerals. Because of well spacing limitations, minerals from up to 1,920 acres of federal mineral estate would not be available because of NSO and NSSO stipulations. However, because of the interspersion of private lands in the proposed lease area, the amount of unavailable federal mineral estate would be expected to be much less.

3.13.2.4 Alternative C

Developing 25 wells would allow oil and gas production from almost all the federal mineral estate and State- and privately-owned minerals. Because of their proximity to federal mineral estate outside the lease area and current well spacing, some minerals at the periphery of the lease area might not be available for production. Applying lease stipulations would cause minor decreased lease values and minor to moderate increased operating costs, primarily during the development phase. The special status plant species and freshwater aquatic habitat stipulations would affect approximately 190 acres of federal mineral estate (Maps 4 and 5). The big game winter range stipulation would affect 4,800 acres (Map 6). Fragile soils are associated with approximately 2,600 acres of federal mineral estate and floodplains would affect <1 acre (Maps 3 and 5). Impacts from other resource stipulations and lease notices cannot be determined at this time because surveys have not been conducted for the resources; however, migratory birds, raptors, burrowing mammals, and bats likely are associated with most of the federal mineral estate.

3.13.3 Mitigation

Applying the drainage stipulation in Alternative C would ensure that the lessee of a parcel adequately addresses the issue of uncompensated drainage.

3.13.4 Cumulative Impacts – Minerals (Fluid)

Cumulative impacts to fluid minerals are based on the RFDS created for this document (Table 2, Appendix 1) and the actions described below.

3.13.4.1 Scope of Analysis

The CIAA is the 15,644-acre Little Willow Creek proposed oil and gas lease area because only federal minerals in the lease area would be available. Well spacing guidance should prevent uncompensated drainage from the federal mineral estate outside the proposed lease area. The lease period of 10 years will be used for the temporal analysis limit because the federal mineral estate would be available for production during that time period, but not necessarily beyond.

3.13.4.2 Current Conditions and Effects of Past and Present Actions

In addition to the 6,349 acres of federal mineral estate, the CIAA includes 493 acres of State-owned minerals and 8,799 acres of private-owned minerals. The lease status of the State and private minerals is unknown. Six wells (three drilled and pending pipelines and three in the process of being drilled) occur in (three wells) or within 0.5 miles (three wells) of the CIAA. The wells are associated with privately-owned minerals; however, one well is within 0.15 miles of State-owned minerals.

3.13.4.3 Reasonably Foreseeable Future Actions

Two wells on privately-owned minerals could be drilled. Wells associated with State-owned minerals could be subject to stipulations for unstable soils, wildlife, threatened and endangered species, and floodplains (Appendix 2). Private lessors could also incorporate stipulations in their lease agreements; however, their scope is unknown.

3.13.4.4 Alternative A – Cumulative Impacts

Not leasing 6,349 acres of federal mineral estate could have minor (if the federal mineral estate is omitted) to moderate (if not omitted) adverse additive impacts to the value of unleased State- and privately-owned minerals. Stipulations associated with State-owned minerals could have minor adverse impacts on lease values and operating costs.

3.13.4.5 Alternative B – Cumulative Impacts

Leasing 6,349 acres of federal mineral estate with NSO and NSSO stipulations could have minor (if stipulations have a limited effect on accessibility) to moderate (if stipulations affect accessibility) adverse additive impacts to the value of unleased State- and privately-owned minerals. Stipulations associated with State-owned minerals would be as described in Alternative A (Section 3.13.4.4).

3.13.4.6 Alternative C – Cumulative Impacts

Leasing 6,349 acres of federal mineral estate with stipulations and lease notices would have minor adverse additive impacts to the value of unleased State- and privately-owned minerals. Stipulations associated with State-owned minerals would be as described in Alternative A (Section 3.13.4.4).

3.14 Social and Economic

3.14.1 Affected Environment – Social and Economic

Social and Environmental Justice

The 2010 Payette County population was 22,623, an increase of 10% from 2000. In comparison, the state population increased 21% between 2000 and 2010, Ada and Canyon counties increased 30.4% and 43.7% respectively. The 2010 Payette County population density was 55 persons/mi^2, compared to 18.8 for Idaho as a whole and 370 and 313 for Ada and Canyon counties respectively. The areas in the vicinity of the proposed lease area are home to farms, ranches, and dispersed residences.

As defined in Executive Order 12898, minority, low income populations, and disadvantaged groups are present in Payette County. Between 2008 and 2012, 19.2% of Payette County's population lived below the poverty line compared to 15.1% of Idaho's total population (Payette County QuickFacts, USCB 2014). The County is not very ethnically or racially diverse. In 2010, 85% of residents identified themselves as being non-Hispanic or Latino ethnicity and 15% of residents reported having Hispanic ancestry (US Census Bureau 2010). Non-white races including African American, Asian, American Indian, Pacific Islander, and others accounted for 11% of the population. In 2010, American Indians accounted for 1.1% of Payette County's population compared to 1.4% for the state as a whole. Tribes in Idaho and elsewhere have an interest in lands in Payette County; however, BLM is unaware of potential interest involving the proposed lease area.

Economics

In 2011, Payette County supported 9,606 jobs and had a 9.1% unemployment rate (Table 12). Non-services related industries (e.g., farm, construction, and manufacturing) accounted for 2,868 jobs, while service related industries (e.g., wholesale, retail, transportation, finance, real estate, and health care) accounted for 5,330 jobs and government accounted for 1,146 jobs (U.S. Department of Commerce 2011). In 2012, labor earnings of $325 million included $100 million in non-services related, $153 million in services related, and $47 million in government related earnings. The 2011 per capita income was $29,475. Total personal income (TPI) in 2011 was estimated to be $667 million including a net residential inflow of $105 million (earnings gained from outside the county – earnings leaving the county). Total personal income includes labor and non-labor income, including money earned on investments (interest, dividends, and rents) and transfer payments relating to age (Medicare and Social Security payments) or poverty (Medicaid or welfare assistance). Idaho had 147 people employed in oil and gas extraction activities statewide in 2011 (IPAA 2012).

Table 12. Employment (2011) and personal income (2012) by industry, Payette County, Idaho.

Industry	**Employment (jobs)**	**Personal Income (Thousands of 2012 dollars)**	**Average Income/Job (Thousands of 2012 dollars)**
Farm	974	$28,255	$29
Forestry & Related Activities	na	na	na
Mining (incl. fossil fuels)[1]	na	na	na
Construction[1]	780	$25,285	$32.4
Manufacturing	1,114	$46,321	$41.6
Utilities	95	$10,480	$110.3
Wholesale Trade[1]	278	$9,247	$33.3
Retail Trade[1]	734	$13,380	$18.2
Transportation & Warehousing[1]	341	$13,446	$39.4
Information	111	$6,604	$59.5
Finance & Insurance[1]	381	$9,798	$25.7
Real Estate & Rental & Leasing[1]	426	$3,543	$8.3
Professional & Tech. Services[1]	313	$10,763	$34.4
Management of Companies[1]	90	$8,503	$94.5
Admin. & Waste Services[1]	526	$9,587	$18.2
Educational Services	90	$868	$9.6
Health Care & Social Assistance[1]	844	$35,832	$42.5
Arts, Entertainment, and Rec	94	$545	$5.8
Accommodation & Food Services[1]	294	$3,843	$13.1
Other Services[1]	713	$16,977	$23.8
Government[1]	1,146	$47,312	$41.3
Total	9,606	$325,048	$33.8

[1] Industries that typically add jobs to support oil and gas leasing, exploration, and production activities.

Oil and Gas Leasing and Production

Local economic effects of leasing federal minerals for oil and gas exploration, development, and production are influenced by the number of acres leased, the number of wells drilled, and the estimated levels of production. These activities influence local employment, income, and public revenues (indicators of economic impacts). There are no federal-administered leases in the area; however, in 2014, the IDL leased 4,006 acres of State owned lands and minerals in Payette County.

Leasing - Federal oil and gas leases generate a one-time lease bid as well as annual rents. Parcels containing federal minerals, which have been approved for leasing, are auctioned off periodically to interested parties starting at a minimum bid of $2.00 per acre. Many parcels leased at auction generate bonus bids in excess of the minimum bid. In 2014, bonus bids ranged from $50.24/acre (October) to $79.68/acre (January) for State leases; however, because no leases have been offered, figures for federal minerals are not available. Once federal minerals are leased, leases are subject to annual rent or royalty payments. Rent on leased minerals is $1.50 per acre per year for the first five years and $2.00 per acre per year thereafter. Typically, oil and gas leases expire after 10 years unless drilling activity on these parcels results in one or more producing wells.

Production – Idaho currently has one producing well on private land and none associated with federal mineral estate (IPAA 2012, IDL 2014). Of 18 Payette County gas wells currently permitted by IDL, one is in production, 10 have been drilled and are shut pending a pipeline (Table 11). Once production begins, federally leased minerals are considered to be held by production and lease holders are required to pay royalties on production instead of annual rent. The BLM also considers mineral leases to be held by production if they have been incorporated into fields or units working cooperatively to increase extraction capabilities.

Federal oil and gas production is subject to production taxes or royalties. On public domain lands, these federal oil and gas royalties generally equal 12.5% of the value of production (43 CFR 3103.3.1), of which 50% would be allocated to the State and 50% would be allocated to the U.S. Treasury. In Idaho, 90% of federal mineral royalty revenues that the state receives are distributed to the Public School Income Fund and 10% distributed to the general fund of the counties where the revenue was generated. For State leases, a 12.5% production royalty is distributed to the permanent fund of the appropriate beneficiary, other State agencies, and the General Fund. The 2.5% production tax goes to the producing county (11.2% of tax revenue), cities within the producing county (11.2%), public schools (11.2%), local economic development (6.4%), and an oil and gas conservation fund (60%).

Local Economic Contribution - Oil and gas development has the potential to stimulate economic activity in a number of sectors throughout the region. Exploration, development, and production activities create a multiplier effect in the local economy as money spent in the oil and gas related industries is spent and re-spent in other industries (Table 12).

3.14.2 Environmental Consequences – Social and Economic

Impacts to the social and economic environment are based on the RFDS created for this document (Table 2, Appendix 1).

3.14.2.1 General Discussion of Impacts

<u>Social and Environmental Justice</u>

Development of a lease may generate impacts to people living near or using the area in the vicinity of the lease. Oil and gas exploration, drilling, or production could create an inconvenience to these people due to increased traffic and traffic delays, noise, and visual impacts. This could be especially noticeable in areas where oil and gas development has been minimal. The amount of inconvenience would depend on the activity affected, traffic patterns within the area, noise levels, length of time, and season these activities occurred, etc. Creation of new access roads into an area could allow increased public access and exposure of private property to vandalism. For split estate leases, surface owner agreements, standard lease stipulations, and BMPs could address many of the concerns of private surface owners. Production and development activities could disproportionately affect disadvantaged groups where the activities are specifically targeted to their communities or properties to the benefit or avoidance of non-disadvantaged groups. They could also provide job opportunities for those groups.

Economics

Local and/or out-of-state workers could be hired or contracted to meet the direct and indirect needs of development and production. Individual income for workers typically associated with development and production activities would vary from $8,300 to $94,500 annually (Table 12). Mining-related jobs would likely pay above the median income ($32,400/year). Total new jobs created could be relatively low because some work would be short-term in nature. For each million dollars in gas production, 2.4 jobs could be created in the county of production (Weber 2012). Employees may shift to higher paying energy-related jobs creating a labor shortage for local employers. Sudden influxes of workers could reduce affordable housing availability. An influx of workers and equipment without commensurate financial support could adversely affect public and private sector infrastructure (schools, hospitals, law enforcement, fire protection, and other community needs), especially in rural communities. Tax, royalty, spending, and income revenues associated with leasing, development, and production would benefit local, county, State, and national economies. Stipulations that affect access to mineral resources could reduce economic return for lessors and lessees. Activities that increase access to mineral resources could benefit other mineral rights holders. Activities that adversely affect health, safety, or the environment could cause short- or long-term decreases in personal income and property values. Wildlife depredation on agricultural fields could adversely affect productivity of some crops (e.g., winter wheat, alfalfa).

Disclosure of the direct, indirect, and cumulative effects of GHG emissions provides information on the potential economic effects of climate change including effects that could be termed the "social cost of carbon" (SCC). The EPA and other federal agencies developed a method for estimating the SCC and a range of estimated values (EPA 2014). The SCC estimates damages associated with climate change impacts to net agricultural productivity, human health, property damage, and ecosystems. Using a 3% average discount rate and year 2020 values, the incremental SCC is estimated to be $51 per ton of annual CO_2eq increase.

3.14.2.2 Alternative A

Social and Environmental Justice

Not leasing the federal mineral estate in the project area would limit the development potential of the project area to only two wells, both located on private lands. Developing two wells and associated infrastructure would have minor short-term impacts from increased traffic and noise and long-term visual, public access, and vandalism impacts. Limited increases in access and worker influx would occur. There are disadvantaged groups in Payette County, but they do not appear to be disproportionately associated with the two wells or the proposed lease area.

Economics

By not leasing, federal, state, or local revenues would not be generated from leasing, rents, or royalties from federal mineral estate. If BLM does not lease the federal minerals, it is likely that the IOGCC would allow the federal mineral estate to be omitted from the drilling unit. Moderate (if 493 acres associated with existing wells are omitted) to major (if up to 6,349 acres throughout the lease area are omitted) resource and revenue losses would occur if the IOGCC omitted the federal mineral estate and productive wells are drilled on private lands in the same unit. Development and production of two wells would cause minor employment and income increases. Negligible to minor impacts to labor and housing availability and infrastructure would occur over the short term. Adjacent mineral rights holders would experience minor beneficial (omission allowed) or moderate adverse (omission not granted) financial impacts. Adverse water quality and availability (Section 3.5.2.2), safety, and environmental impacts would primarily affect individual landowners in the immediate vicinity of the wells. Negligible wildlife depredation losses could occur.

Based on the GHG emission estimate (Table 6), the annual SCC associated with two wells would be $295,137 (in 2011 dollars). Estimated SCC is not directly comparable to economic contributions reported above, which recognize certain economic contributions to the local area and governmental agencies, but do not include all contributions to private entities at the regional and national scale. Direct comparison of SCC to the economic contributions reported above is also not appropriate because costs associated with climate change are borne by many different entities.

3.14.2.3 Alternative B

Social and Environmental Justice

Developing 22 wells and associated infrastructure would have moderate to major short-term increased traffic and noise impacts and long-term visual impacts. Minor (access controlled by private landowners) to major (access not controlled by private landowners) access and vandalism impacts could occur over the long term. A moderate worker influx could adversely affect traditional lifestyles. Disadvantaged groups in Payette County would not be directly affected by the wells, but access to affordable housing and social services in nearby communities could be reduced during the short term.

Economics

Federal, state, or local revenues would be generated from leasing and rents ($9,528 to $12,704 annually) during the 10-year lease period. The NSO and NSSO stipulations could reduce the lease value and bonus bid amounts. Developing and maintaining 22 wells would have minor to moderate short-term and negligible long-term job increases. Royalty income would depend on how productive the wells are and cannot be estimated at this time. Minor to moderate impacts to labor and housing availability and infrastructure would occur over the short term. Adjacent mineral rights holders would experience moderate financial benefits where access to their minerals improved. Adverse water quality and availability (Section 3.5.2.3), safety, and environmental impacts could have negligible (wells remain intact and don't affect ground water) to major (surface and ground water adversely affected by multiple wells) to the adjacent landowners and downstream communities. Minor to moderate wildlife depredation losses could occur. Based on the GHG emission estimate (Table 6), the annual SCC associated with 22 wells would be $3,246,711 (in 2011 dollars).

3.14.2.4 Alternative C

Social and Environmental Justice

The impacts of developing 25 wells and associated infrastructure would be as described in Alternative B (Section 3.14.2.3).

Economics

Leasing 6,349 acres and associated development and production would have similar revenue, job, labor and housing availability, infrastructure, and adjacent mineral rights holder impacts as described in Alternative B (Section 3.14.2.3). The impact of CSU stipulations on lease value would be less than Alternative B and royalty income could be greater. Adverse water quality and availability (Section 3.5.2.4), safety, and environmental impacts would be similar to Alternative B; however, the freshwater aquatic habitat CSU stipulation could provide minor to moderate surface water protection. Minor wildlife depredation losses could occur. Based on the GHG emission estimate (Table 6), the annual SCC associated with 25 wells would be $3,689,442 (in 2011 dollars).

3.14.3 Mitigation

Measures that limit or control dust, noise, odors and protect visual impacts and water quality resources would help reduce social and economic impacts (Dahl et. al. 2010).

3.14.4 Cumulative Impacts – Social and Economic

Cumulative impacts to the social and economic environment are based on the RFDS created for this document (Table 2, Appendix 1), RFDS for the Willow and Hamilton fields, and the activities identified below.

3.14.4.1 Scope of Analysis

Payette County will serve as the CIAA. Although social and economic costs and benefits could occur at regional, state, national, and international levels, the majority would occur at the county level. The lease period of 10 years will be used for the temporal analysis limit because the federal mineral estate would be available for production during that time period, but not necessarily beyond.

3.14.4.2 Current Conditions and Effects of Past and Present Actions

Current Payette County social and economic conditions are described in Section 3.14.1. All State-owned minerals (Section 3.13.1) and an unknown acreage of privately-owned minerals have been leased in recent years. The State leases will expire between 2016 (14,181 acres) and 2024. The existing 17 oil and gas wells have been developed over several years, although the majority of work occurred since 2011. Exploration work is ongoing in the County. The effect of these activities on social and economic conditions, beyond State lease rental returns, is unknown.

3.14.4.3 Reasonably Foreseeable Future Actions

Oil and Gas Lease Development and Production – Development of wells and associated infrastructure would occur on private and State leases in the Willow and Hamilton (one new well proposed October 2014) fields. Current development is approximately two to four wells annually.

3.14.4.4 Alternative A – Cumulative Impacts

<u>Social and Environmental Justice</u>

Development of two wells and associated infrastructure would have negligible additive traffic, noise, visual, access, vandalism, and worker influx impacts. Development of up to 53 wells in the Hamilton and Willow fields would have minor impacts. The county's population base is large enough that changes associated with oil and gas development would be relatively unnoticeable.

<u>Economics</u>

Not leasing federal mineral estate would have negligible additive adverse revenue impacts. Development of two wells and associated infrastructure would have negligible additive employment, income, labor and housing availability, infrastructure, water quality and availability, and SCC impacts. Development of up to 53 wells in the Hamilton and Willow fields would have minor revenue, employment, income, labor and housing availability, infrastructure, safety, and environmental impacts. Development in the Hamilton and Willow fields could cause minor (water availability affected by increased use) to moderate (water quality adversely affected by persistent pollutants) water quality and availability and SCC ($7,660,302) impacts. The county's economic and employment base is large enough that changes associated with oil and gas development would be relatively unnoticeable.

3.14.4.5 Alternatives B and C – Cumulative Impacts

<u>Social and Environmental Justice</u>

Leasing federal mineral estate and the subsequent development of 22-25 wells and associated infrastructure would have minor additive traffic, noise, visual, access, vandalism, and worker influx impacts. Impacts from other oil and gas development would be as described in Alternative A (Section 3.14.4.4).

<u>Economics</u>

Leasing federal mineral estate and the subsequent development of 22-25 wells and associated infrastructure would have minor additive employment, income, labor and housing availability, and infrastructure impacts and minor to moderate additive water quality and availability and SCC impacts. Impacts from other oil and gas development would be as described in Alternative A (Section 3.14.4.4).

4.0 Consultation and Coordination

4.1 List of Preparers

Name	Position
Jonathan Beck	Planning and Environmental Coordinator, ID State Office and Boise District
Aimee Betts	Associate District Manager, Boise District
M.J. Byrne	Public Affairs, Boise District
Tate Fischer	Field Office Manager, Four Rivers
Sarah Garcia	Rangeland Management Specialist, Four Rivers
Lara Hannon	Natural Resource Specialist/Acting NEPA Specialist, Boise District
Valerie Lenhartzen	Geologist, Four Rivers
Matthew McCoy	Assistant Field Office Manager, Four Rivers
David Murphy	Branch Chief, Realty, ID State Office
Karen Porter	Geologist, ID State Office
Larry Ridenhour	Outdoor Recreation Planner, Four Rivers
Dean Shaw	Archaeologist, Four Rivers
Mark Steiger	Botanist, Four Rivers
Allen Tarter	Natural Resource Specialist (Riparian), Four Rivers

4.2 List of Agencies, Organizations, and Individuals Consulted

Affected Landowners and Permittees (84 individual or companies within 1 mile of proposed lease area)
Allen and Kirmse, Ltd
Alta Mesa Service, Inc., c/o F. David Murrell
Burns Paiute Tribe, Tribal Chairman
Canyon County Commissioners
Confederate Tribes of the Umatilla, Tribal Chairman
Congressman Raul Labrador
Energy West Corp.
Gem County Commissioners
Grazing Board Resource Area Representatives, Phil Soulen
Grazing Board Resource Area Representatives, Stan Boyd
Grazing Board Resource Area Representatives, Weldon Branch
Idaho Citizens Against Resource Extraction
Idaho Conservation League, John Robinson
Idaho Department of Agriculture
Idaho Department of Fish & Game c/o Rick Ward
Idaho Department of Lands c/o Grazing Program Manager
Idaho Governor, CL "Butch" Otter
Idaho Lieutenant Governor Brad Little
Idaho Office of Energy Resources, c/o John Chatburn

Larry Craig
Moffitt Thomas and Associates
Nez Perce Tribes, Tribal Chairman
SBS Associates, LLC
Senator Jim Risch
Senator Mike Crapo
Shoshone-Bannock Tribe, c/o Nathan Small
Shoshone-Paiute Tribe, c/o Ted Howard
Trendwell Energy Corp.
US Fish and Wildlife Service
Washington County Commissioners
Weiser-Brown Oil Co, c/o Richard Brown
Western Watersheds Project
WildLands Defense, Katie Fite

Native American Consultation

BLM is required to consult with Native American tribes to "help assure (1) that federally recognized tribal governments and Native American individuals, whose traditional uses of public land might be affected by a proposed action, will have sufficient opportunity to contribute to the decision, and (2) that the decision maker will give tribal concerns proper consideration" (U.S. Department of the Interior, *BLM Manual Handbook H-8120-1*). Tribal coordination and consultation responsibilities are implemented under laws and executive orders that are specific to cultural resources which are referred to as "cultural resource authorities," and under regulations that are not specific which are termed "general authorities." Cultural resource authorities include: the *National Historic Preservation Act of 1966*, as amended (NHPA); the *Archaeological Resources Protection Act of 1979*; and the *Native American Graves Protection and Repatriation Act of 1990, as amended*. General authorities include: the *American Indian Religious Freedom Act of 1979*; the NEPA; the FLPMA; and *Executive Order 13007-Indian Sacred Sites*. The proposed action is in compliance with the aforementioned authorities.

Southwest Idaho is the homeland of two culturally and linguistically related tribes: the Northern Shoshone and the Northern Paiute. In the latter half of the 19th century, a reservation was established at Duck Valley on the Nevada/Idaho border west of the Bruneau River. Today, the Shoshone-Paiute Tribes residing on the Duck Valley Reservation actively practice their culture and retain aboriginal rights and/or interests in this area. The Shoshone-Paiute Tribes assert aboriginal rights to their traditional homelands as their treaties with the United States, the Boise Valley Treaty of 1864 and the Bruneau Valley Treaty of 1866, which would have extinguished aboriginal title to the lands now federally administered, were never ratified.

Other tribes that have ties to southwest Idaho include the Bannock Tribe and the Nez Perce Tribe. Southeast Idaho is the homeland of the Northern Shoshone Tribe and the Bannock Tribe. In 1867 a reservation was established at Fort Hall in southeastern Idaho. The Fort Bridger Treaty of 1868 applies to BLM's relationship with the Shoshone-Bannock Tribes. The northern part of the BLM's Boise District was also inhabited by the Nez Perce Tribe. The Nez Perce signed treaties in 1855, 1863 and 1868. BLM considers off-reservation treaty-reserved fishing, hunting, gathering, and similar rights of access and resource use on the public lands for all tribes that may be affected by a proposed action.

The BLM initiated consultation with the Shoshone-Paiute Tribes during the June 19, 2014 Wings and Roots Program, Native American Campfire meeting. At that time, the Tribes were provided an information "early alert" with updated information from the June 12, 2014, field trip. The Shoshone-Paiute Tribes did not respond to a July 3, 2014 scoping letter, but will be consulted once again at the December 2014 Wings and Roots Program, Native American Campfire meeting.

4.3 Public Participation

The BLM received public scoping comments from the following individuals and entities (see Section 8.0 Comment Response for comments specific to the draft EA):

Alta Mesa Services, Inc.
Idaho Concerned Residents for the Environment (ICARE)
Idaho Office of Energy Resources
Idaho Petroleum Council
Idaho Residents Against Gas Extraction (IRAGE)
Jason Williams
JoAnn Higby
Lyndsey Winters Juel
Marilyn Richardson
Terry Paulus
William Fowkes and Alice Whitford
Western Watersheds Project (WWP)

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6.0 Appendices

6.1 Appendix 1. Reasonably foreseeable development scenario for the proposed Little Willow Creek oil and gas lease area, Payette County, Idaho.

REASONABLY FORESEEABLE DEVELOPMENT SCENARIO

FOR

PROTECTIVE OIL AND GAS LEASING

IN PARTS OF
TOWNSHIP 8 NORTH, RANGE 4 WEST
TOWNSHIP 9 NORTH, RANGE 4 WEST, AND
TOWNSHIP 9 NORTH, RANGE 3 WEST
BOISE MERIDIAN

FOUR RIVERS FIELD OFFICE
IDAHO

Prepared by: ______________________________ Date: ____________
Karen Porter
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SUMMARY

The BLM's Four Rivers Field Office is currently analyzing the environmental effects of offering 6474.62 acres of federal mineral estate for competitive oil and gas leasing. This RFDS is being written in support of that analysis, to inform the public and the preparers of the environmental assessment of the disturbance that could occur as a result of leasing the lands, so that the environmental impacts can be determined and mitigation measures, in the form of lease stipulations, can be developed to minimize those impacts. The BLM plans to offer these lands in a lease sale in early 2015, in order to protect the federal mineral estate from potential drainage caused by the development of a natural gas field that is presently occurring on private lands, referred to by the developer as the Willow Field.

According to an April 16, 2013 order by the Idaho Oil and Gas Conservation Commission, well spacing in the area is one well per government section, or 640 acres. In the northern part of the field, lands with reserved federal mineral estate (also called split estate) are intermingled with some of the private lands, causing conflicts for the developer. Idaho BLM has been deferring leasing in the Four Rivers FO while the current land use plan, the CRMP, is being revised. The CRMP/EIS was completed in 1987, and, while it identified lands closed to leasing and identified some areas as No Surface Occupancy, the analysis does not meet current BLM standards for oil and gas leasing. One major component that is missing is an analysis based on a Reasonably Foreseeable Development Scenario, or RFDS. Therefore, this RFDS describes the likely disturbance that could occur if BLM were to select any of the alternatives being proposed.

This Reasonably Foreseeable Development Scenario (RFDS) indicates that the following impacts could occur, by alternative:

Alternative A (No Action) - If BLM does not lease in the project area, development drilling could occur in only 2 sections- T. 8 N., R. 4 W., section 2, and T. 9 N., R. 4 W., section 36. The lands in these sections are private and do not contain any federal mineral estate. Technically only two wells could be drilled in the project area. This would result in approximately 10 acres of disturbance.

Alternative B (Lease with NSO/NSSO) - Offering leases with NSO/NSSO would allow those sections that have lands with federal mineral estate to be drilled, however the drilling could not occur on the federal mineral estate. The only federal action would be to administer the leases and collect royalties. As there is only one section that has 100% federal minerals (T 9 N., R. 4 W., section 26) and there are 25 sections within the project boundary, technically Alt B could result in up to 24 wells. However, in looking at the topography of each section, it is noted that there are several sections where the private land is either inaccessible or is too steep to be suitable as a drill site. Two sections- T. 9 N., R. 4 W., section 13, and T. 9 N., R. 3 W., section 17- do not have favorable private land conditions for drilling. Therefore, if Alt B were selected, it is estimated that 22 wells would be drilled in the project area, resulting in 77 acres of disturbance.

Alts C (Lease with Cascade RMP stipulations and additional lease notices) - Generally all federal minerals would be available for development, resulting in the drilling of 25 wells (one per section), and 88 acres of disturbance.

It is anticipated that one geophysical exploration program would occur and that it would likely be conducted along existing roads or trails or by overland travel, thereby causing minor impacts to surface resources.

INTRODUCTION

This report describes the anticipated level of oil and gas exploration and development activity associated with issuing oil and gas leases in the project area. This projection is necessary so that the impacts to other natural resources can be analyzed in an environmental assessment, and to determine what if any stipulations, in addition to those on the standard lease form and those required by BLM policy, may be necessary to attach to the leases in order to mitigate those impacts.

ASSUMPTIONS AND DISCUSSION

- It is assumed that one well would be drilled per government section of approximately 640 acres. This is based on the state of Idaho's well spacing order.

- If a well is to be located on a federal lease, the lessee will be required to submit a drilling permit (APD) to BLM for approval prior to commencing operations. Site-specific NEPA would then be conducted, and additional site-specific requirements, termed Conditions of Approval, may be attached to the APD. If the well is to be located on fee lands, the lessee would seek approval for a drilling permit from the Idaho Department of Lands.

- If drilling is proposed on split estate lands, the lessee will be required to contact the surface owner and attempt to reach an agreement concerning surface access prior to submitting the APD. In accordance with BLM's Onshore Order Number One, upon submitting an APD, the lessee or its operator must certify to the BLM that: (1) It made a good faith effort to notify the private surface owner before entry; and (2) A Surface Access Agreement with the surface owner has been reached, or that a good faith effort to reach an agreement failed. The Surface Access Agreement may include terms or conditions of use, be a waiver, or an agreement for compensation. BLM is not a party to the surface agreement, however if no agreement is reached with the surface owner, the operator is required to submit an adequate bond (minimum of $1000) to the BLM for the benefit of the surface owner, in an amount sufficient to compensate for any loss of crops or damage to tangible improvements. This is a separate and distinct bond from the reclamation bond required under 43 CFR 3104.

- Based on the recent drilling that has occurred in the Willow Field, it is assumed that any well drilled would be a vertical hole, and that it would not require hydraulic fracturing. It is also assumed that the well would be a natural gas well.

- If the well is productive, it is assumed that it would be incorporated into the Willow Field unit development. If dry, the well would be plugged and abandoned, and the site would be reclaimed.

- Oil and gas leases are issued for an initial term of 10 years, subject to extension if there is drilling occurring or if there is a producing well on the lease.

ANTICIPATED SURFACE DISTURBANCE DUE TO OIL AND GAS ACTIVITIES

The following phases of oil and gas exploration/development are typical in searching for and developing an oil and gas resource:

1. Geophysical Exploration
2. Drilling Phase
3. Field Development and Production
4. Plugging and Abandonment

These phases are discussed in detail below.

Phase One: Geophysical Exploration

While a geophysical exploration program may have already been conducted, for the sake of this report it is anticipated that one geophysical exploration program may be conducted during the 10-year initial term of the leases. Geophysical techniques are often implemented to identify subsurface geologic structures and determine drilling targets. The BLM reviews and approves geophysical operations on a case by case basis, and a lease is not necessary for such work. Gravity, magnetics, and seismic reflection are the most common techniques used. Both gravity and magnetic surveys cause very little disturbance as the instruments used are small and easily transportable in light vehicles or OHVs. These surveys can cover large areas and take only weeks to conduct. It is preferable to use existing roads, yet some overland travel is sometimes necessary. In addition, both gravity and magnetic surveys can be completed from aircraft, virtually eliminating surface disturbance.

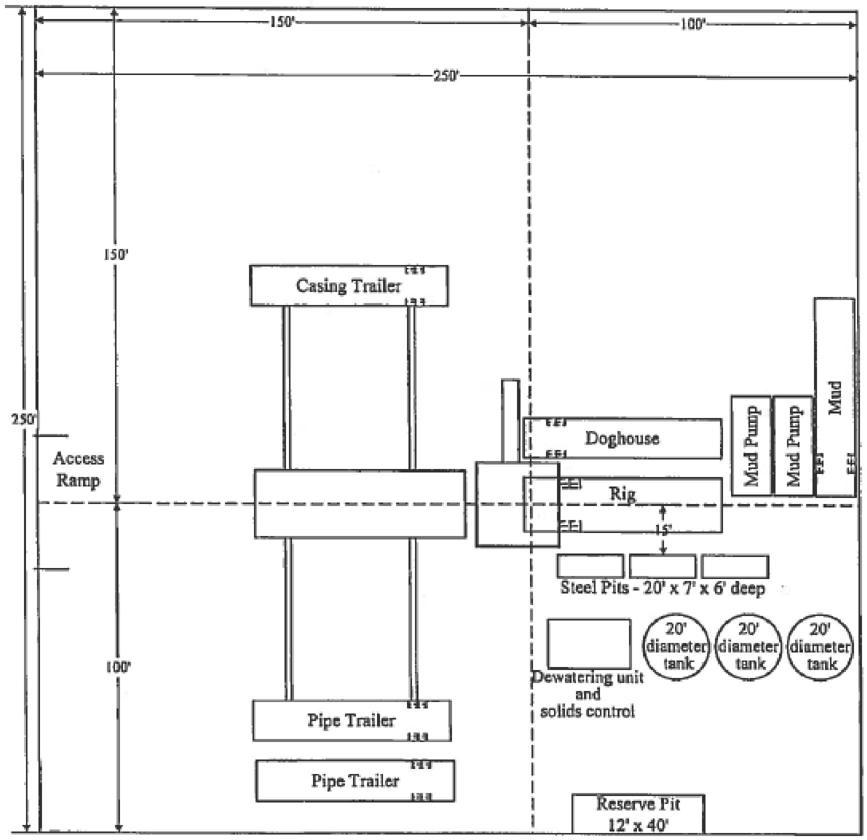
Seismic reflection surveys- either 2D or 3D- are the most commonly used geophysical tool. They require a seismic energy source and an array of receptors that are laid down in rows on the ground surface. Shock waves are created by vibrating or thumping the ground. Reflected seismic waves are recorded by a series of surface equipment along a 3- to 5-mile line. The general principle of seismic reflection is to send elastic waves (using an energy source such as dynamite explosion or Vibroseis) into the Earth, where each layer within the Earth reflects a portion of the wave's energy back and allows the rest to refract through. These reflected energy waves are recorded over a predetermined time period by receivers that detect the motion of the ground in which they are placed. On land, the typical receiver used is a small, portable instrument known as a geophone, which converts ground motion into an analogue electrical signal. In preparation for gathering the seismic data, the survey crew establishes a grid, with source lines running one direction and receiver lines running a different direction. The source lines mark the points where either explosives or vibroseis vehicles will be placed. The receiver lines mark points where geophones (small devices inserted into the ground that pick up reflected vibrations) are placed to take readings when either a small explosion is set off or, more commonly, the vibroseis vehicles are used. Either method is used to send vibrations underground that are reflected back to the surface where readings are taken by geophones on the receiver lines and transferred to a data recorder vehicle. A crew of 10 to 15 people with five to seven vehicles is used, and several square miles can be surveyed in a single day. The geophones are then retrieved from the ground, and moved to the next survey area.

Phase Two: Drilling Phase

Given Idaho’s well spacing requirements, it is assumed that a single well would be drilled in each section. If the proposed well is located on lands with federal minerals (i.e. on a federal lease), the lessee is required to submit an APD to BLM. If the proposed well is located on lands with private or state minerals, the lessee would submit a drilling permit application to the Idaho Department of Lands. Drilling on federal mineral estate would be analyzed by BLM in a site-specific NEPA document, and would involve coordination with the surface owner. Conditions of Approval, specific to the proposed activity and site, would be developed and attached to the drilling permit. These conditions, as well as the lease contract itself and any additional stipulations, would need to be complied with. A reclamation bond is required, and if necessary, a surface owner bond would be held by BLM on the surface owner’s behalf.

Vehicle access to each drill pad would be required, to transport the drill rig, personnel, and other heavy equipment to the drill site. Existing roads may be used, however may require upgrading. Most of the individual parcels can be accessed off of the Little Willow Creek road, which is paved. Two-track and gravel roads that branch off of Little Willow Creek may require upgrading. Typically, roads are constructed with a 20-foot wide graveled running surface with adjacent ditches and berms, for a total disturbance width of about 40 feet. It may be necessary to haul in gravel to obtain a good road base, as well as a base for the well pad. In the area of the subject parcels, there are several good gravel roads that provide access to some part of the section that would be an appropriate drilling site. It is unlikely that the lessee would need access to the top of the bluffs on which many of the parcels lie. Given the existing road density in the area, it is assumed that an average of 1/4 of a mile of new road construction would be required to access the drill sites. Surface disturbance from the construction of 1/4 mile of road equals approximately one acre.

A drill pad is required to accommodate the rig and equipment. Previous drill pads in the Willow Field have been approximately 1.5 acres in size, however this report assumes a larger pad of 2.5 acres (300’ x 350’). Topsoil and existing vegetation is scraped from the well pad site and stored on site for reclamation. The drill pad must be level, possibly requiring some cut-and-fill of the site. In addition to the drill rig, the well pad may house a reserve pit for storage or disposal of water, drill mud, and cuttings; several mud pits and pumps, drill pipe racks, a fuel tank, a water tank, a generator and several compressors, equipment storage, and several trailers for temporary lab and office quarters. To date, reserve pits associated with developing the Willow Field have all been lined with a 12-mil synthetic liner. Below is a schematic diagram of an actual well pad (from Bridge Energy Resources' drilling permit application to IDL):



Getting the rig and ancillary equipment to the site may require 15 to 20 trips by full-sized tractor-trailers, with a similar amount for de-mobilizing the rig. There would be 10 to 40 daily trips for commuting and hauling in equipment. Drilling operations would likely occur 24 hours a day and seven days a week. It takes approximately one month to drill one well. A drilling operation generally has from 10 to 15 people on-site at all times, with more people coming and going periodically with equipment and supplies.

Well drilling also requires water. As much water as possible is recycled on site, yet about 5,000 to 15,000 gallons of water may be needed each day depending on well conditions. Initially, water would need to be provided, either by wells or trucked in, to meet demands. Many oil or gas wells encounter water at depth when drilling for oil and/or gas, as it may be part of the oil and gas reservoir, and can be utilized when production is ongoing.

Production wells drilled in the Willow Field to-date have been 24 inches in diameter at the surface, gradually narrowing (telescoping) to 8¾ inches at the bottom of the well. In order to drill these deep, large-diameter holes, a large drilling rig is utilized. The top of the drill rig derrick could be as much as 155 feet above the ground surface, and the rig floor could be at least 25 feet above the ground surface. These rigs are typically equipped with diesel engines, fuel and drilling mud storage tanks, mud pumps, and other ancillary equipment. Once drilling commences, drilling fluid or mud is continuously circulated down the drill pipe and back to the surface equipment. The purpose of the drilling mud is to balance underground hydrostatic pressure, cool the drill bit, and flush out rock cuttings.

The risk of an uncontrolled flow from the reservoir to the surface (occasionally caused by encountering a pressurized thermal pocket) is greatly reduced by using a blowout preventer—a series of hydraulically-actuated steel rams that can close quickly around the drill string or casing to seal off a well. The BOP is pressure-tested after installation to ensure proper operation. Steel casing is run into completed sections of the borehole and cemented into place. The casing provides structural support to maintain the integrity of the borehole and isolates underground formations.

Exploration holes drilled to-date in the Willow Field have ranged in depth from 2500 to 6900 feet. At the conclusion of well testing, if paying quantities of oil and gas are not discovered, the operator is required to plug and abandon the well according to State standards. Cement plugs are placed above and below water-bearing units with drilling mud placed in the space between plugs. When abandonment is complete, the site is reclaimed, which includes pad and road recontouring, topsoil replacement, and seeding with approved mixtures. Erosion control measures would be incorporated into the reclamation design as needed.

The drilling site could be active for approximately one year, from the start of drill pad and access road construction; through drilling and well testing; to completion of plugging the hole and reclamation.

Phase Three: Field Development and Production

Where oil and gas flow to the surface naturally, control valves and collection pipes are attached to the well head. Otherwise a pump may be installed. Oil is typically produced along with water and gas. Once the raw hydrocarbon reaches the surface, it would be routed through a pipeline to a central production facility, which gathers and separates the produced fluids (oil, gas and water). A production facility is currently being constructed on private lands on the east side of the town of New Plymouth, and dehydration plant has been constructed on Highway 30, immediately north of Interstate 84. The production facility processes the hydrocarbon fluids and separates oil, gas and water. The oil must usually be free of dissolved gas before export. Similarly, the gas must be stabilized and free of liquids and unwanted components such as hydrogen sulphide and carbon dioxide. Any water produced would be treated at these facilities before disposal. Produced water at the well site is disposed of either through surface discharge, evaporation ponds or re-injection into the producing formation.

The producing life span of an oil or gas field varies depending on field characteristics. A field may produce for a few years to many decades. Commodity price, recovery technique, and the political environment also affect the life of a field. Abandonment of wells may begin as soon as they are depleted or wells may be rested for a period of time or drilled to a different horizon, and put back into production.

Phase Four: Abandonment

If paying quantities of oil and gas are not discovered, or at the end of the producing life span of a producing well or field, the operator is required to plug and abandon the well according to Federal and State standards and reclaim the disturbed areas. To plug a well, cement plugs are placed above and below water-bearing units with drilling mud placed in the space between plugs. When well abandonment is complete, equipment and surface facilities are removed, and the site is reclaimed. In a producing field, underground pipelines are often plugged and left in place in order to avoid re-disturbing these areas. Site reclamation includes pad and road obliteration and recontouring, topsoil replacement, and seeding with approved mixtures. Erosion control measures would be incorporated into the reclamation design as needed.

CONCLUSION

Surface disturbance associated with the anticipated leasing of the federal mineral estate in the project area would be approximately 5 acres per well. One well can be drilled per section according to the State of Idaho's well spacing order. Therefore, depending on which alternative is selected, between 10 acres and 125 acres could be disturbed. Pad and access road construction, drilling and well testing, and reclamation would take an estimated 4-6 months, depending on well depth and drilling conditions encountered. It is reasonably likely that well testing would be favorable for production, in which case a pipeline would likely be installed to transport the hydrocarbons to a central production facility located off-lease, located on private land several miles to the south. It is anticipated that one geophysical survey program would be completed during the life of the lease. This disturbance would be temporary, on the order of weeks, and would result in minor to negligible surface impacts.

This RFDS meets the requirements of BLM's Manual Section 1624-2 in describing potential surface impacts that could occur as a result of leasing the federal mineral estate in the project area.

6.2 Appendix 2. State lease stipulations in the vicinity of the proposed Little Willow Creek lease area, Payette County, Idaho.

1. Construction Notification. Lessee shall notify and obtain approval from Idaho Department of Lands (IDL) prior to constructing well pads, roads, power lines, and related facilities that may require surface disturbance on the tract. Lessee shall submit a surface use plan of operations to IDL and obtain approval before beginning surface disturbance activities. Lessee shall comply with any mitigation measures stipulated in IDL's approval.
2. Surface Owner Notification. If the State does not own the surface, the Lessee must contact the owner of the surface in writing at least 30 days prior to any surface activity. A copy of the correspondence shall be sent to IDL.
3. Unstable Soils. Due to unstable soil conditions on this tract and/or topography that is rough and/or steep, surface use may be restricted or denied. Seismic activity may be restricted to surface shots.
4. Metalliferous/Gem Lease. This lease is issued subject to a prior existing State of Idaho metalliferous/gem lease. Lessee's rights to search, develop, and produce oil and gas may be restricted by such prior existing lease rights.
5. Wildlife Concerns. Potential wildlife conflicts have been identified for this tract. The applicant must contact the Idaho Department of Fish and Game (IDFG) in the area for advice on alleviating any possible conflicts caused by the Lessee's proposed activities. Documentation that IDFG requirements have been satisfied unless otherwise authorized by IDL is required. Additional mitigation measures may also be required.
6. Threatened and Endangered Plant Species. Plant species of concern have been identified on or near this tract. A vegetation survey in areas of proposed activity will be required prior to disturbance. Identified rare plant species will be avoided, unless otherwise authorized by the IDL.
7. Threatened and Endangered Animal Species. Animal species of concern have been identified on or near this tract. A survey in areas of proposed activity will be required prior to disturbance. Identified habitat of threatened and endangered species will be avoided, unless otherwise authorized by the IDL.
8. Navigable Waters and Infrastructure. Unless otherwise approved by IDL in writing, wells and related surface infrastructure, including new road construction, are prohibited within 1/4 mile of the mean high water mark of a navigable river, lake or reservoir, including direct tributary streams of navigable waterways, on or adjacent to this tract. No surface occupancy is allowed within the bed of a river, stream, lake or reservoir, islands and accretions or abandoned channels.
9. Floodplain. Due to the floodplain/wetlands area(s), surface use may be restricted or denied.
10. Surveys. If the lessee completes a successful oil and/or gas well, and if land title is disputed, the lessee shall fund professional land surveys as needed to determine the location and acreage encompassed by the spacing and/or pooling unit and the state lease acreage within that unit. Surveys shall be conducted by a licensed land surveyor acceptable to IDL, and shall be prepared pursuant to survey requirements provide by the IDL.
11. Public Trust Lands. This tract contains navigable riverbeds. No surface occupancy is allowed within the bed of the navigable river, abandoned channels, or on islands and

accretions. In addition, upon completion of a successful well, where river title is disputed, the Lessee will file an interpleader action under Rule 22 of Idaho Rules of Civil Procedure in the local District Court, or other court having jurisdiction, in which the leased lands are located for all acreage within the lease in which the title is disputed. The Lessee shall name all potential royalty claimants as defendants.

12. Existing Surface Uses. Due to existing surface uses (such as center pivots, wheel lines, etc.) development on this tract may be restricted.
13. Activity restrictions. No activity shall be allowed within 100 feet of any perennial or seasonal stream, pond, lake, wetland, spring, reservoir, well, aqueduct, irrigation ditch, canal, or related facilities without prior approval of the IDL.
14. Sage Grouse. Active sage-grouse lek(s) have been identified on or adjacent to this tract. No activities shall occur on the tract until the proposed action has been approved in writing by the Director of the Department. If surface activity is proposed on the tract, the Department will consult with the Director of Idaho Department of Fish and Game (IDFG) for their comments, concerns and recommendations. Additional mitigation measures may be required, including no-surface-occupancy buffers and/or timing restrictions, which may encompass part or the entire tract.
15. No Surface Occupancy. No Surface Occupancy shall be allowed on this tract.

6.3 Appendix 3. Legal description of lease parcels and applicability of Alternative C stipulations and lease notices.

Legal description of lease parcels.

Parcel	Legal Description			Acres
	Township/Range	Section	Quartersection/Lot	
A	T. 08 N R. 04 W	01	Lots 1-4; S½NE¼; S½NW¼; N½SE¼	364.78
		03	Lots 3 and 4; SW1/4NW1/4; W½SW1/4	185.11
		04	Lots 1 and 2; S½NE¼; SE¼NW¼; SE¼; E½SW¼	426.53
		05	Lots 1-3; SE¼NW¼; E½SW¼	223.22
		08	E½NW¼	79.39
		12	NW¼; SW¼	312.44
		13	N½SE¼; SE¼SW¼	117.49
		24	NE¼NW¼	39.32
	Total			**1,748.29**
B	T. 09 N R. 04 W	28	N½NE¼; SW¼NE¼; NW¼; W½SE¼; N½SW¼	430.33
		32	SW¼NW¼	38.88
		33	NE¼NW¼; NW¼SE¼	80.03
	Total			**549.25**
C	T. 09 N R. 04 W	26	All	628.28
		27	E½NE¼; SW¼NE¼; W½NW¼; N½SE¼; SE¼SE¼	312.27
		34	NE¼; NE¼SE¼; S½SE¼	276.04
		35	N½NW¼; SW¼NW¼; SW¼SW¼	157.90
	Total			**1,374.49**
D	T. 09 N R. 03 W	18	Lots 2-4	125.56
		19	Lots 1 and 4; NE¼NW¼	123.06
	T. 09 N R. 04 W	13	S½NE¼; E½NW¼; S½	469.41
		24	N½NE¼; SW¼NE¼; S½SE¼; NW¼SE¼; W½	551.35
		25	W½	316.36
	Total			**1,585.74**
E	T. 09 N R. 03 W	17	S½NE¼; SE¼; W½	544.94
		18	NE¼; N½SE¼; SE¼SE¼	273.15
		20	NW¼NE¼; N½NW¼; SW¼NW¼	155.79
		29	N½NE¼; NE¼NW¼	117.55
	Total			**1,091.43**
Total				**6,349.20**

Applicability of stipulations and lease notices by parcel.

Stipulation/Lease Notice	Parcel[1]				
	A	**B**	**C**	**D**	**E**
Freshwater Aquatic Habitat CSU-1: 500’ buffer from surface waters	Y	N	N	Y	Y
Freshwater Aquatic Habitat CSU-2: 100’ buffer from surface waters	Y	N	N	Y	Y
Special Status Plants CSU -3: Types 1-4	P	Y	P	P	P
Big Game Range CSU-4: No surface use December 1 – March 31 any species; May 1 – June 30 antelope	Y	Y	Y	Y	Y
Sensitive Wildlife Species CSU-5: No surface use ≤0.75 miles of ferruginous and Swainson’s hawk nests March 15 – June 30	P	P	P	P	P
Sensitive Wildlife Species CSU-6: No surface use ≤0.75 miles of osprey nests April 15 – August 31	P	P	P	P	P

Stipulation/Lease Notice	Parcel[1]				
	A	B	C	D	E
Sensitive Wildlife Species CSU-7: No surface use $\leq$0.25 miles of burrowing owl nests March 15 – June 30	P	P	P	P	P
Wildlife Species of Concern CSU-8: No surface use $\leq$0.75 miles of golden eagle nests February 1 – June 30	P	P	P	P	P
Wildlife Species of Concern CSU-9: No surface use $\leq$0.75 miles of prairie falcon nests March 15 – June 30	P	P	P	P	P
Wildlife Species of Concern CSU -10: No surface use $\leq$0. 5 miles of heron rookery	P	P	P	P	P
Fragile Soils LN-1: Minimize adverse impacts to fragile soils	Y	Y	Y	Y	Y
Floodplain Management LN-2: Minimize adverse impacts to 100-year floodplain	Y	Y	N	N	N
Endangered Species S-1: Consultation and mitigation to protect listed species and critical habitat.	Y	Y	Y	Y	Y
Special Status Mammals LN-3: Minimize adverse impacts to SIDGS and pygmy rabbits.	P	P	P	P	P
Migratory Birds and Raptors LN-4: Compliance with MBTA by minimizing adverse impacts to migratory birds.	P	P	P	P	P
Migratory Birds and Raptors CSU-11: No surface use $\leq$1 mile of active bald eagle or peregrine falcon nest. No surface use December 1 – March 31 where wintering bald eagles or peregrine falcons are present.	P	P	P	P	P
Water Quality LN-5: Reduce impacts on water quality and quantity.	Y	Y	Y	Y	Y
Cultural Resources S-2: Comply with applicable statutes and executive orders.	Y	Y	Y	Y	Y
Cultural Resources LN-6: Cultural resource survey.	Y	Y	Y	Y	Y
Lands and Realty LN-7: Existing authorizations.	Y	Y	Y	Y	Y
Drainage LN-A: Wells on adjacent private lands.	Y	Y	Y	Y	Y
Split Estate LN-B: Surface use agreement required on split-estate.	Y	Y	Y	Y	Y
Paleontological Resources CSU-12: No surface use on identified resources.	Y	Y	Y	Y	Y
Paleontological Resources LN-7: Paleontological resource survey.	Y	Y	Y	Y	Y

[1] Y – applies to at least a portion of the parcel. P – potentially applies based on subsequent survey work. N – would not apply to that parcel.

6.4 Appendix 4. Idaho BLM special status animal species known to, or potentially occurring, in the Little Willow Creek lease area, Payette County, Idaho.

Type 1. Federally Listed Species and Critical Habitat: Includes species that are listed under the Endangered Species Act as Threatened (T) or Endangered (E) and designated critical habitats.

Type 2. BLM Special Status Species: Includes FWS Candidate (C), Delisted within 5-years (D), Proposed (P), Experimental Population (XN), and Proposed Critical Habitat (PCH); and BLM Sensitive Species.

The proposed lease area does not currently provide habitat for any Type 1 species. The proposed lease area is outside the range or typical habitat of the following special status animal species that occur in the Four Rivers Field Office, so they will not be considered further: Idaho giant salamander, Cassin's finch, Columbian sharp-tailed grouse, flammulated owl, harlequin duck, Lewis' woodpecker, mountain quail, bull trout, redband trout, white sturgeon, ashy pebblesnail, California floater, bighorn sheep, coast mole, fisher, grizzly bear, northern Idaho ground squirrel, Piute ground squirrel, and wolverine.

Note* NI=No impacts due to leasing and associated activities
DI=direct impacts due to leasing and associated activities
ID=indirect impacts due to leasing and associated activities

Common Name	Scientific Name	Habitat	Management Considerations
Amphibians			
Northern Leopard Frog	*Rana pipiens*	Wetlands, riparian areas, and adjacent uplands	DI – Adverse water quality impacts could cause mortality or affect breeding, etc. Discussed in Section 3.6.2 (Aquatic Species).
Western Toad	*Bufo boreas*	Ponds, streams, and adjacent uplands.	DI – Adverse water quality impacts could cause mortality or affect breeding, etc. Discussed in Section 3.6.2 (Aquatic Species).
Woodhouse's Toad	*Bufo woodhousii*	Grasslands, shrublands, agricultural areas, and ponds.	DI – Adverse water quality impacts could cause mortality or affect breeding, etc. Discussed in Section 3.6.2 (Aquatic Species).
Birds			
Bald Eagle	*Haliaeetus leucocephalus*	Winter migrant to lease area. Habitat includes lakes, reservoirs, streams, and uplands.	NI - No known nesting pairs are present. ID – Could occur for wintering birds where activities affect big game presence and winterkill. Discussed in Section 3.6.2 (Migratory Birds and Raptors).

Common Name	Scientific Name	Habitat	Management Considerations
Black Tern	*Chlidonias niger*	Open water lakes (>10 acres), ditches, and emergent wetlands.	ID – Activities could disturb migrating birds, but lease area doesn’t provide nesting habitat.
Black-throated Sparrow	*Amphispiza bilineata*	Breeds in barren and grassy hillsides with scattered sagebrush and rabbitbrush.	DI/ID – Activities could reduce nesting foraging habitat, but lease area is on northern edge of species range.
Brewer’s Sparrow	*Spizella breweri*	Sagebrush-steppe, nests in shrubs.	ID – Extensive sagebrush stands are not present; however, activities could affect species during migration.
Burrowing Owl	*Athene cunicularia*	Gently-sloping areas of shrubsteppe.	DI – Ground disturbing activities could destroy nests. ID - Activities could disturb or reduce prey species. Discussed in Section 3.6.2 (Migratory Birds and Raptors).
Ferruginous Hawk	*Buteo regalis*	Open country, nests on ground or rock outcrops, forages in shrubsteppe and grassland habitats.	ID – Activities could disturb or reduce prey species. Discussed in Section 3.6.2 (Migratory Birds and Raptors).
Golden Eagle	*Aquila chrysaetos*	Open country, nests on cliffs and artificial structures, forages in shrubsteppe and grassland habitats.	ID – Activities could disturb or reduce prey species. Discussed in Section 3.6.2 (Migratory Birds and Raptors).
Grasshopper Sparrow	*Ammodramus savannarum*	Shrubsteppe grasslands	DI/ID – Activities could reduce nesting and foraging habitat. Discussed in Section 3.6.2 (Migratory Birds and Raptors).
Greater Sage-grouse (C)	*Centrocercus urophasianus*	Sagebrush obligate.	NI - Outside currently delineated ranges, area lacks key habitat component.
Green-tailed Towhee	*Pipilo chlorurus*	Shrubsteppe in areas with high diversity of shrub species.	ID – Shrub stands are limited; however, activities could affect species during migration.
Loggerhead Shrike	*Lanius ludovicianus*	Shrubsteppe, open woodlands. Nests in tall shrubs and small trees.	ID – Activities could disturb or reduce nesting habitat and prey species. Discussed in Section 3.6.2 (Migratory Birds and Raptors).
Long-billed Curlew	*Numenius americanus*	Short-grass or mixed-prairie with flat rolling topography.	DI/ID – Activities could disrupt breeding, reduce nesting and foraging habitat. Discussed in Section 3.6.2 (Migratory Birds and Raptors).
Northern Goshawk	*Accipiter gentilis*	Aspen stands and conifer forests	NI – Habitat not present, occasional migrants could be affected by activities.
Olive-sided Flycatcher	*Contopus cooperi*	Montane or coniferous forests and riparian areas.	ID – Disturbance of birds using riparian areas during migration.
Sage Sparrow	*Amphispiza belli*	Sagebrush-steppe, nests in shrubs.	ID – Extensive sagebrush stands are not present; however, activities could affect species during migration.

Common Name	Scientific Name	Habitat	Management Considerations
Sage Thrasher	*Oreoscoptes montanus*	Sagebrush obligate	ID – Extensive sagebrush stands are not present; however, activities could affect species during migration.
Short-eared Owl	*Asio flammeus*	Large expanses of shrubsteppe and grasslands.	DI/ID – Activities could disrupt breeding, reduce nesting and foraging habitat. Discussed in Section 3.6.2 (Migratory Birds and Raptors).
Willow Flycatcher	*Empidonax trailii*	Dense willow riparian areas.	ID – Pollution could reduce prey species. Discussed in Section 3.6.2 (Migratory Birds and Raptors).
Yellow-billed Cuckoo (T)	*Coccyzus americanus*	Thick, wide riparian corridors, primarily dominated by cottonwoods. Known only as rare erratic breeder in the Snake River corridor mainly in southeast Idaho. Limited potential habitat occurs in area.	NI - Outside currently delineated ranges, area lacks key habitat component.
Mammals			
Big Brown Bat	*Eptesicus fuscus*	Rural areas and fields.	ID – Activities could reduce foraging success and prey habitat. Discussed in Section 3.6.2 (Bats).
Canyon Bat (formerly Western pipistrelle)	*Parastrellus hesperus*	Canyons and deserts in rock crevices, under rocks, and burrows	DI/ID – Activities could eliminate burrows, reduce foraging success and decrease prey habitat. Discussed in Section 3.6.2 (Bats).
Fringed Myotis	*Myotis thysanoides*	Caves, rock crevices, and open areas.	ID – Activities could reduce foraging success and prey habitat. Northeastern edge of range. Discussed in Section 3.6.2 (Bats).
Grey wolf	*Canus lupus*	Generalist habitat species. Follows big game herds.	ID - Could occur where activities affect big game presence.
Hoary Bat	*Lasiurus cinereus*	Trees, cavities, and open areas.	ID – Activities could reduce foraging success and prey habitat. Discussed in Section 3.6.2 (Bats).
Little Brown Bat	*Myotis lucifugus*	Forested lands near water, caves, and drier open areas.	ID – Activities could reduce foraging success and prey habitat. Discussed in Section 3.6.2 (Bats).
Long-eared Myotis	*Myotis evotis*	Coniferous forest and associated with forest-woodland riparian areas	ID – Insect prey base could be adversely affected by habitat alterations. Discussed in Section 3.6.2 (Bats).
Long-legged Myotis	*Myotis volans*	Coniferous forest and deserts; may change habitat seasonally	ID – Insect prey base could be adversely affected by habitat alterations. . Discussed in Section 3.6.2 (Bats).
Pallid Bat	*Antrozous pallidus*	Arid, semi-arid uplands, sparsely vegetated grasslands, buildings, and caves.	ID – Activities could reduce foraging success and prey habitat. Discussed in Section 3.6.2 (Bats).

Common Name	Scientific Name	Habitat	Management Considerations
Pygmy Rabbit	*Brachylagus idahoensis*	Thick big sagebrush with deep soils.	DI/ID – Burrow destruction, vehicle mortality, foraging habitat. Discussed in Section 3.6.2 (Burrowing Mammals).
Silver-haired Bat	*Lasionycteris noctivagans*	Riparian areas, ponds, and streams.	ID – Activities could reduce foraging success. Pollution could reduce prey species. Discussed in Section 3.6.2 (Bats).
Southern Idaho Ground Squirrel (C)	*Spermophilus brunneus endemicus*	Sagebrush and grasslands	DI/ID – Burrow destruction, vehicle mortality, foraging habitat. Discussed in Section 3.6.2 (Burrowing Mammals).
Spotted Bat	*Euderma maculatum*	Rocky canyons and cliffs, forages over sagebrush.	ID – Insect prey base could be adversely affected by habitat alterations. Discussed in Section 3.6.2 (Bats).
Townsend's Big-eared Bat	*Plecotus townsendii*	Winter in stable-climate caves, forage over sagebrush.	ID – Insect prey base could be adversely affected by habitat alterations. Discussed in Section 3.6.2 (Bats).
Western Small-footed Myotis	*Myotis ciliolabrum*	Winters in lava tube caves and rock crevices, under boulders, and beneath loose bark in summer	ID – Insect prey base could be adversely affected by habitat alterations. Discussed in Section 3.6.2 (Bats).
Yuma Myotis	*Myotis yumanensis*	Wide elevation range including riparian, desert scrub and mesic woodland and forested areas.	ID – Insect prey base could be adversely affected by habitat alterations. Discussed in Section 3.6.2 (Bats).
Reptiles			
Great basin Black-collared Lizard	*Crotaphytus bicinctores*	Deserts, presence of rocks and boulders.	DI/ID – Vehicle mortality, loss of habitat and prey. Discussed in Section 3.6.2
Longnose Snake	*Rhinocheilus lecontei*	Deserts, grasslands, and rocky canyons.	DI/ID – Vehicle mortality, loss of habitat and prey. Discussed in Section 3.6.2
Western Ground Snake	*Sonora semiannulata*	Deserts with loose or sandy soils.	DI/ID – Vehicle mortality, loss of habitat and prey. Discussed in Section 3.6.2

7.0 Maps

If you are viewing this via the following link on the NEPA Register:
https://www.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=39064&dctmId=0b0003e8806d22d8
Please find the maps in the home page's sidebar under Maps. Select "Map Package to accompany Little Willow Creek Protective Leasing EA".

8.0 Comment Responses

A Draft EA was made available to the public with a 30-day comment period (December 22, 2014 to January 21, 2015). Comments were received from the Idaho Conservation League (ICL); Randy and Thana Kauffman (K); the State of Idaho (SoI) including Office of Energy Resources, Department of Fish and Game, Office of Species Conservation, and Department of Environmental Quality; WildLands Defense (WLD); and WildEarth Guardians (WEG). Responses to summarized comments are provided below (organized by major topic) and the EA was modified as necessary to address some comments.

Land Use Plan

ICL-1: *The CRMP is outdated*.
WLD-7: *The CRMP is outdated and inadequate*.
WEG-7: *Leasing should be deferred until a new RMP is completed.*
Under normal circumstances, BLM offers lands nominated by the public for leasing, that have been identified in a land use plan as eligible and available for leasing. However, BLM regulations state that lands which are subject to drainage should be leased, even if they are otherwise unavailable for leasing (43 CFR 3120.1-1(d)). BLM has determined that the lands currently being considered for lease are or soon will be threatened by drainage of federally-owned oil and gas.

BLM IM 2010-117, Oil and Gas Leasing Reform Land Use Planning and Lease Parcel Reviews states: "There are other considerations that should be taken into account when determining the availability of parcels for lease." Field offices should consider whether… "There is a risk of drainage to Federal mineral resources due to development of nearby non-Federal parcels if the parcel is not leased (based upon a determination made by a Petroleum Engineer or Petroleum Geologist)."

The1988 CRMP provided a variety of stipulations related to issues and resources identified during that process (Section 2.3); however, BLM guidance allows for additional requirements to address changing resource concerns. According to IM 2010-117, "If a proposed modification to the terms of a stipulation changes the extent, but does not result in a new planning decision (e.g., the timing limitation protective radius increases from 2 miles to 3 miles, but the stipulation remains a moderate constraint), no plan amendment is required. The site-specific NEPA compliance documentation for the lease, however, may need to analyze the proposed stipulation modification if this analysis has not already been conducted in the NEPA documentation associated with the land use plan." Lease notices are included in Alternative C to address additional resource concerns.

WLD-13 and WEG-6: *The CRMP does not support oil and gas leasing*.
The CRMP Final EIS analyzed the effects of designating areas open to gas leasing. This EA analyzes several alternatives, including Alternative C, which includes stipulations based on management direction from the CRMP. If post-lease actions are proposed (exploration and/or development), additional NEPA will be conducted to analyze site-specific effects of the proposed actions.

NEPA Adequacy

WLD-1: *An EIS is needed to address the impacts*.
The act of leasing (Alternatives B and C) would not constitute a major federal action that would significantly affect the quality of the human environment; therefore, an Environmental Impact Statement is not required. The BLM will determine the level of NEPA analysis needed when/if an APD is received. See also WLD-13 and WEG-6.

WLD-2: *The cumulative effects areas are not adequate*.
See cumulative effects sections in the EA. The CIAAs were selected based on BLM's knowledge of current oil and gas leasing in the area and the RFDS developed for this EA. It is difficult to speculate what will be nominated for oil and gas leasing in the future, as well as how much exploration and development will result. The RFDS created for this EA is BLM's best estimate and was analyzed in relative detail in the Environmental Consequences and Cumulative Impacts sections (Section 3.0).

WLD-5: *Adequate baseline information for a variety of resources was not provided or considered; therefore, none of the alternatives can be adequately analyzed*.
The interdisciplinary team used the best available resource data to create the baselines for analyzing alternatives (e.g., data from BLM, USDA/NRCS, IDFG/IFWIS, IDEQ, IDWR, EPA, US Census Bureau, etc.). The affected environment sections provide summaries of baseline data.

WLD-9: *The BLM must consider a broad range of alternatives and mitigation actions to protect air, water, and natural resources and human health. The proposed protection measures are inadequate*.
The alternatives analyzed provide a range of protection measures to federal mineral reserves and associated lands and resources. Direct impacts to resources associated with federal mineral reserve lands would not occur in Alternative A and indirect impacts would be limited. Direct impacts to resources associated with federal mineral reserve lands would also not occur in Alternative B; however, indirect impacts would occur. Direct and indirect impacts to resources associated with federal mineral reserve lands would occur in Alternative C; however, a variety of protective measures would help limit their degree. This EA begins to identify potential mitigation measures; however, APDs and associated NEPA analyses would help guide development of the most appropriate measures.

WLD-11: *The proposed lease and associated EA represents a piecemeal approach and does not adequately address all alternatives*.
The BLM is following its national guidance on the NEPA approach for leasing and subsequent, if any, drilling. Leasing and post-lease activities are not analyzed in the same NEPA document, since nationally, only about 10% of oil and gas leases ever get drilled. It is impossible to speculate precisely where, how, and what post-lease activities will occur, since a lease can be for up to 2,560 acres in size. BLM has taken a hard look at the impacts of leasing in this area with three alternatives and over 100 pages of analysis in this EA.

If an APD is proposed once a lease is issued, BLM will conduct a thorough and in-depth analysis that is site- and activity-specific. Mitigation measures in the form of enforceable Conditions of Approval would be attached to each APD. The BLM lease terms and stipulations, onshore orders, and regulations must be followed, and a performance bond must be accepted by BLM before any surface disturbing activities can occur. The BLM will monitor and inspect operations to ensure that the lessee is in compliance with BLM's requirements for both surface as well as down-hole resources.

WEG-1: *Leasing the BLM parcels may enable expanded drilling on State and/or private lands.*
The range of alternatives clearly indicates that leasing would likely increase drilling opportunities on State and/or private lands. Existing (2) and proposed wells (2) occur on non-federal leases in the proposed lease area (Map 1). The RFDS and associated analyses recognize how many wells could be drilled within the lease area without (Alternative A – 2 new wells) or with (Alternatives B and C – 22 or 25 new wells, respectively) a federal lease. The current State well spacing of 1 well/640 acres was one of the factors used to determine the number of wells that could be drilled by alternative. The EA also recognizes that if federal minerals are omitted, then up to 25 new wells could potentially be drilled. With few exceptions (e.g., visual resource management and realty rights-of-way designations that do not apply to non-federal lands), potential impacts were described irrespective of land ownership.

WLD-12: *The drainage explanation and current status of leases in the area are unclear*.
WEG-5: *Drainage is not a compelling reason for leasing.*
Based on a current State of Idaho well spacing of 1 well/640 acres the BLM assumes that a well could drain mineral reserves in a 640 acre area regardless of ownership. Four existing wells and two proposed wells are within 0.5 miles of federal mineral resources. The existing wells are classified as "shut in pending a pipeline" indicating that they are producing wells. In a September 4, 2014 IOGCC hearing, the commission voted 4-1 to reconsider a request by Alta Mesa to omit federal mineral resources. If federal minerals are omitted from a drilling unit, BLM would be unable to collect the royalties it is due for its proportionate share of the drilling unit; therefore, the BLM considers these resources threatened by uncompensated drainage.

While 43 CFR 3162.2-2 offers several protective measures that BLM may take to avoid uncompensated drainage on unleased lands, they all require the cooperation of the owner-of-interest in the producing well, except for leasing. The BLM has offered several times to enter into a communitization or compensatory royalty agreement with Alta Mesa; however, Alta Mesa has rejected those offers. Existing and proposed wells provide some indication of non-BLM lease activity; however, the BLM does not have specific knowledge of existing leases in the proposed lease area.

WLD-14: *The proposed action violates the laws and policies described in Section 1.6*.
The BLM disagrees and finds that impacts to sensitive resources can be mitigated by application of stipulations, lease terms and conditions, onshore orders, and regulations for leasing.

Alternatives
K-1: *Parcel A should be split into two parcels along the Little Willow Road*.

The BLM will consider this comment prior to releasing the Notice of Lease Sale. The environmental impacts would be the same.

Vegetation

WLD-21: *Site specific surveys are lacking and impact magnitudes are discounted because of current conditions*.

The IDFG report information specific to the EOs in the proposed leasing area and CIAAs was added (Section 3.3.1). This information supports the current conditions and conclusions presented in the EA.

Air Resources

Table 6 in the Draft EA incorrectly used oxides of nitrogen values rather than nitrous oxides values for calculating greenhouse gas production. The nitrous oxides and consequently CO_2 eq values have been adjusted accordingly.

WLD-22: *The referenced air quality report is biased and inadequate*.

WLD-19: *Potential impacts to climate change are not adequately addressed*.

ICL-2: *Substantial increases in carbon dioxide equivalent emissions need to be mitigated.*

The BLM contracted the Kleinfelder Report to evaluate air quality impacts associated with oil and gas development activities for the Four Rivers RMP. The report provides detailed emission estimates of criteria pollutants, greenhouse gases (GHG), and key hazardous air pollutants (HAPs) anticipated to be released during each phase of oil and gas development for a representative oil and gas well in the western United States. The report acknowledges that defining a "representative" oil and gas well for the entire western U.S. is extremely challenging as there are numerous variables that can materially affect the emissions. Such variables include oil and gas composition, difficulty drilling the geologic formation, oil and gas production rate, equipment at the well site, emission controls, and the amount of produced water that may be associated with oil and gas production, among many others. Five well types (three natural gas wells and two oil wells), representative of different oil and gas basins in the western U.S., were evaluated.

The three types of natural gas wells were summarized as:

1. Uinta/Piceance Basin represents deep (15,000 feet) wells which may be drilled into shale with dry gas. These wells produce a moderate amount of condensate (420 gal/day) and 168,000 gal/yr of produced water. Methane emissions are estimated at 12.2 tons/yr (Table 13) and the Global Warming Potential (GWP) is estimated at 2,825 tons of CO_2 eq/yr.

2. San Juan Basin represents shallow (2,500-7,000 feet) wells with dry gas. These wells produce little to no condensate (210 gal/day) and 33,600 gal/yr of produced water. Other equipment included in the emissions inventory includes a pumpjack engine (to remove water) and a condensate tank. Average gas production per well, over the life of the well is estimated to be 27.8 MMscf/day (million cubic feet/day). Methane emissions

estimated at 6.1 tons per year. GWP is estimated at 791 tons of CO_2 equivalent.

3. Upper Green River Basin represents deep wells drilled into non-shale formations with wet gas, and higher condensate production (1,260 gal/day) and 126,000 gal/yr of produced water. More water vapor is present in the gas at this well, so each well site contains a dehydrator, separator, and line heater. The wells are drilled at relatively high density. Average gas production per well, over the life of the well is estimated to be 4.0 MMscf/day. Methane emissions estimated at 14.1 tons per year (Table 13). GWP is estimated at 3,194 tons of CO_2 equivalent.

Table 13. Total GHG emissions (tons/year) for two wells, Kleinfelder Report.

	Upper Green River Basin			**San Juan Basin**		
	CO_2	**CH_4**	**N_2O**	**CO_2**	**CH_4**	**N_2O**
Construction Phase	33.84	0.001	0.0003	33.84	0.001	0.0003
Development Phase	1900.27	1.11	0.0498	561.61	1.05	0.0389
Operation Phase	947.96	12.99	0.0018	56.44	4.99	0.0004
Total	2882.07	14.10	0.0519	651.89	6.05	0.0396

For the Upper Green River Basin well, the following methane emissions (tons/year) are estimated, broken out by the development stage of the well:

Construction Phase 0.001 tons/yr
Sources: tailpipe of construction equipment, trucks

Development Phase (i.e. drilling and well treatment)

Sources:	Drill rig engine	0.03	(18 days, 24 hrs)
	Well frac engine	0.04	(7 days, 24 hrs)
	Frac flowback venting	0.94	(100 hrs)
	Workover venting	0.094	(once, 5000 Scf)
	TOTAL	1.104 tons methane/yr	

Operational Phase (i.e. Production activities)

Sources:	Fugitive emissions	3.16	
	(97 valves, 348 connectors, 12 OE lines, 6 PR valves)		
	Process heaters	0.0178	
	Wellsite tank flashing	0.552	
	Pneumatic devices:		
	Dump valves	8.896	four (4) valves, intermittent bleed
	Pneumatic controller	0.229	(low bleed)
	Pneumatic pumps	0.131	(chemical sandpiper, glycol)
	TOTAL	12.99 tons methane/yr	

The construction and development (drilling) phases of oil and gas development are not major sources of methane emissions; however, methane releases during the development phase can occur, resulting mainly from actuation of gas-operated valves during well operations and from fugitive gas leaks along the infrastructure required for the production and transmission of gas.

Several pneumatic devices are used at the wellhead to control the amount of fluid in the product. Raw natural gas must be free of oil and water before it is piped to a processing plant. This liquid removal takes place in a vessel called a separator, located at or near the wellhead. A pneumatic controller regulates the fluid level in the separator. When the fluid reaches a certain level, the controller's pilot directs gas to a diaphragm valve, which opens and dumps the liquid into a storage tank. Liquid separators at most older well sites have pneumatic controllers with dump valves that vent natural gas continuously. Newer valves (intermittent) vent only when fluid levels are actively being controlled, and emit only so much gas as is needed to open the dump valve so it can close again at the end of the dump cycle (from Devon Energy Corp. website "Tiny Valve- Big Difference").

The number of pneumatic devices used on a well is presumably determined by the amount of condensate (oil) and water produced. Since this information is not known, it is difficult to determine which gas well in the Kleinfelder Report is representative of conditions in the Little Willow Field. Because many of the input parameters for drilling and operations on the Little Willow Creek wells are unknown, BLM used the pollutant values for the Upper Green River Basin well in Table 6 of the EA. This represents a worst-case scenario for emissions at a natural gas well. A review of emissions inventories that have been conducted by other BLM offices in areas with more densely spaced wells than in Idaho (where spacing is limited to one well per 640 acres) reveals that the Kleinfelder Report used by BLM for this EA is conservative. It is likely that actual emissions at a Willow Field well head would be lower than the Upper Green River well (i.e., other inventories reported lower emissions values for GHG than what was used in this EA).

Implementation of mitigation measures (Section 3.4.3) at the APD processing stage could markedly reduce these emission values. The potential increases are substantial for Payette County, which currently produces limited amounts of Greenhouse Gases; however, when considered at larger scales [e.g., the four-county CIAA where they could account for a 1.7% increase over current levels or 0.001% of the 2012 US CO_2 eq production of 7,195 million tons (EPA: http://www.epa.gov/climatechange/ghgemissions/gases.html)], they represent negligible to minor increases. At the time an APD is submitted, additional NEPA analysis would be conducted, and a Condition of Approval can be attached to the APD that requires methane emissions not exceed a certain threshold, based on the best available information and analysis at that time.

The BLM is currently working at the national level to adopt new standards regarding venting and flaring to reduce natural gas waste and methane pollution. According to a DOI news release dated January 23, 2015, the new draft standards are scheduled to be put out for public comment this spring. According to the standard lease terms, the Willow Creek leases would be subject to those new standards, even if the leases are issued prior to adoption of the new standards.

SoI-3: *The BLM needs to consider air and water quality impacts and appropriate stipulations to maintain them if leasing occurs*.
Air and water quality impacts are discussed in Sections 3.4.2 and 3.5.2, respectively. While there would be no impacts associated with issuing leases, post-lease activities could be proposed that would result in impacts as discussed in those sections. Potential mitigation measures are identified in Sections 3.4.3 and 3.5.3. For air quality, these measures would be further refined based on site- and project-specific circumstances and would be imposed as APD Conditions of Approval, described in Section 3.4.3, as appropriate.

Section 2.3 of the EA provides lease stipulations and notices designed to protect water resources under Alternative C. For example, Freshwater Aquatic Habitat stipulations (CSU 1 and CSU 2) protect surface water quality in sensitive areas. Lease notices to inform the lessee that protective measures may be required if post-lease activities are proposed to minimize impacts within the 100-year floodplain (LN-2) and to minimize impacts to water quality and quantity (LN-5). Additionally, BLM is currently working at the national level to adopt new regulations regarding hydraulic fracturing. A final rule is anticipated in spring 2015. According to the standard lease terms, the Willow Creek leases would be subject to those new standards, even if the leases are issued prior to adoption of the new standards.

WLD-4: *The pollution emission zone and local and regional airsheds have not been mapped or adequately analyzed*.
WLD-23: *The air quality cumulative effects analysis is inadequate*.
The analysis areas include Payette County for localized impacts and a four county area (Ada, Baker, Canyon, and Payette) for CIAA. The analyses were conducted at county levels because the EPA provides information at that scale. These counties largely address the area you expressed concerns about (Treasure Valley) and the likely area pollutants would spread from the proposed lease. They include parts of two airsheds identified in Idaho; however, the EPA does not provide data by airsheds. The proposed lease area is 65 (Eagle Cap Wilderness), 67 (Hells Canyon Wilderness), or 72 (Sawtooth Wilderness) miles from the nearest Class 1 airshed areas. With the exception of GHG, which would affect resources at a much larger scale, pollutants from the development and production phase would typically not travel that far. North Ada County is a nonattainment zone for CO and PM_{10}. Maintenance plans are in place to address these issues (EPA 2015, Idaho nonattainment area plans, http://yosemite.epa.gov/r10/airpage.nsf/283d45bd5bb068e68825650f0064cdc2/e2ab2cc6df433b8688256b2f00800ff8?OpenDocument). Ada and Canyon counties are also considered areas of concern for $PM_{2.5}$ and O_3. There are no nonattainment areas in eastern Oregon, but La Grande has a PM_{10} maintenance plan in place. Without mitigation measures, the maximum RFDS of 25 wells add 0.1% and 0.7% respectively to CO and PM_{10} pollutants in the CIAA.

Water Resources
WLD-3: *Water depletion, quality, and protection issues were not adequately addressed*.
WLD-24: *Current water quality conditions need to be clarified*.
The EA provides what is publicly known about water quality in the area (Section 3.5.1). The BLM is not aware of any further pesticide or other chemical testing of ground or surface waters

in the area. Water quality in Little Willow Creek especially is variable because of agricultural influences (dewatering for irrigation and potential pollutants in return flows). Until more specific information at the APD phase is available, the current analysis can only provide a broad range of impacts (Sections 3.5.2 and 3.5.4).

WLD-15: *Aquifer and geological strata should be used to inform analyses on aquatic habitat impacts*.
Information, primarily from IDWR and IDEQ, and analyses concerning aquifers are presented in Water Resources (Section 3.5) under the heading "Ground Water." Aquatic habitat impacts are discussed Section 3.6.2. Stipulations concerning freshwater aquatic habitat are included as part of Alternative C.

WLD-4: *The pollution emission zone has not been mapped*.
The BLM is not clear what you mean by pollution emission zone. The identified CIAA (Section 3.5.4.1) is large enough to consider horizontal pollutant spread through the 10-year analysis period.

WLD-8: *The EA does not adequately address fracking*.
WEG-9: *Impacts of hydraulic fracturing were not adequately addressed.*
While BLM does not anticipate that hydraulic fracturing will be utilized in the Willow Field area, impacts are discussed in Water Resources (Section 3.5.2). If hydraulic fracturing is proposed on a well that has been drilled under an approved APD, it would be analyzed in much greater depth in a subsequent NEPA document. The Idaho Department of Lands has proposed a new rule currently pending the approval of the legislature, which has new requirements including water quality monitoring, should hydraulic fracturing be proposed. Additionally, BLM is currently working at the national level to adopt new regulations regarding hydraulic fracturing. A final rule is anticipated to be released in spring 2015. According to the standard lease terms, the Willow Creek leases would be subject to those new standards, even if leases are issued prior to adoption of the new standards.

Wildlife/Special Status Species
General
WLD-10: *The variety of impacts was not adequately addressed*.
Section 3.6.2.1 describes most of the impacts you identify including disturbance, mortality, changes in habitat quality, fragmentation, and pollution (including erosion and runoff) for the groups of animals they would likely affect. During the APD phase, when the types of development are more clearly identified, impacts would be more readily identified.

Special Status Species
WLD-20: *Inventory requirements for special status species are inadequate*.
SoI-1: *The BLM needs to consider the presence of SIDGS and other special status species and take appropriate measures to inventory and protect them*.
The BLM used the field visits, 2014 Idaho Fish and Wildlife Information System (which includes the referenced SIDGS data), and other data sources to determine presence of special status species in the proposed lease area. Impacts from the proposed actions are discussed in

Section 3.6.2. Sections 2.2, 2.3, 2.4, and 3.6.3 describe measures that would be taken to reduce or avoid impacts. Section 6 of the Lease Terms on the Offer to Lease and Lease for Oil and Gas (Form 3100-11) provide for requiring inventories of resources prior to ground disturbing activities. Lease specific stipulations (S1) and notices (LN-3 and LN-4) also provide for inventory and subsequent mitigation measures. The inventories would occur before and during the APD process and potential impacts would be analyzed in a subsequent EA.

WLD-6: *Leasing would preclude conservation, enhancement, and restoration of sage-grouse and other special status species habitats*.
The proposed lease area is outside any sage-grouse habitat designation; therefore, it would not be a restoration priority for that species. SIDGS are the most prevalent special status species in the proposed lease area. Although development and production activities could degrade habitat, they would not preclude habitat restoration activities once disturbance factors have been stabilized and restoration could be a requirement during the abandonment phase. Efforts to maintain or enhance SIDGS habitat would likely benefit most other special status species.

WLD-16: *The migratory bird and raptor provisions are outdated and scientifically indefensible*.
The winter range avoidance period (November 15 to May 15), which affects 94% of the federal mineral reserve lands, would provide more widespread protections during early breeding and nesting periods for periods not addressed by migratory bird and raptor nesting protections.

WEG-2: *Greater sage-grouse were not adequately addressed*.
The CRMP did not provide leasing stipulations for sage-grouse. Because of historic wildfires and human activities (e.g., livestock grazing), the proposed lease area does not provide suitable sage-grouse habitat. The distances to identified sage-grouse habitat (5-6.5 miles to sagebrush/perennial grass dominated communities [Key, Preliminary General, and Preliminary Priority habitats]) and active leks (9.5 miles)[E] are substantially greater than the 3 mile buffer recommended by Dr. Braun. The proposed lease would not affect sage-grouse in the area; therefore, it would not affect listing decisions.

WEG-4: *Impacts to other sensitive species, especially sagebrush obligates were not adequately addressed.*
Impacts to representative special status species, including SIDGS and sagebrush obligates, are discussed in Sections 3.3.2 and 3.6.2 and Appendix 4. The proposed lease area would affect approximately 4% of the current distribution of SIDGS (based on minimum convex polygon of current and historic locations, assuming 66% of the polygon is suitable habitat). Shrub-dominated communities occur on up to 25% of the lease area, but typically occur in isolated stands (see Figure 1 and Figure 2).

Big Game
SoI-2: *The BLM needs to clarify where big game winter range stipulations would apply, consider impacts to private lands that development would have, and provide adequate measures to avoid disturbance*.
The CRMP used the term crucial; therefore, it was carried forward into this document. The BLM used IDFG data (Map 6) to delineate current big game winter range, combining mule deer,

elk, and pronghorn ranges into one polygon. For Alternative C, the winter timing restriction would apply to all federal mineral estate in winter range (approximately 6,053 acres or 94% of leased lands). Wildlife depredation is discussed in Sections 3.6.2 and 3.14.2. The winter timing restriction was expanded to November 15 to May 15. This expansion is within the 60-day flexibility allowed by BLM policy.

WEG-3: *Impacts to pronghorn winter range were not adequately addressed.*
The EA (Section 3.6.1, Map 6) describe winter ranges for pronghorn, mule deer, and elk. A combination of all three was used for analysis purposes. The CRMP recognized that winter range delineations could change through time[B]; therefore, the winter ranges used in this analysis were developed in cooperation with IDFG using current monitoring information and represent a larger area than was identified in the CRMP. The analyses indicate moderate to major adverse impacts could occur from the proposed levels of development in Alternatives B and C (Sections 3.6.2.3 and 3.6.2.4). The cumulative impacts of changes in habitat conditions from oil and gas production and development and other activities are addressed in Section 3.6.4.

The no surface use limitation (CSU-4) would apply to the exploration, drilling, development and production, and abandonment phases and would cover all activities (e.g., surface disturbing and disruptive). Your concern about exceptions is addressed in Section 3.6.2.4. The proposed lease area is on the periphery of winter range; therefore, it would not affect migration corridors.

Recreation
WLD-17: *Impacts to and by recreationists were not adequately addressed*.
Access to the isolated parcels of BLM-administered lands occurs through private lands. They are near agricultural lands and provide little opportunity for those seeking solitude. Impacts from increased access were addressed in Sections 3.6, 3.7, 3.8, 3.9, and 3.14.

Visual Resources Management
WLD-4: *The visual analysis is inadequate*.
The BLM only manages visual resources on BLM-administered lands. Impacts to visual resources on BLM-administered lands have been analyzed in Section 3.10.

Social and Economic
ICL-3: *Social and economic impacts to landowners were not adequately addressed*.
Social and economic impacts, including land values and use, are addressed in Sections 3.5, 3.13, and 3.14. Private landowners in and adjacent to the proposed lease area have been involved in this process. The concerns raised during the July 20144 scoping period were addressed in the EA. One landowner commented on the EA regarding how parcels were delineated. Analyses during the APD phase will provide more in-depth assessment of these issues.

WLD-4: *The noise zone has not been mapped*.
Noise impacts to wildlife and humans are discussed in Sections 3.6.2 and 3.14, respectively. Noise is an impact that is more appropriately analyzed in the NEPA for an APD, and can be mitigated by applying a Condition of Approval requiring noise reduction measures, if needed.

WEG-8: *The social cost of carbon needs to be addressed.*
The social cost of carbon is addressed in Air Resources and Social and Economic sections 3.4.2 and 3.14.2, respectively.

Other Resources

WLD-18: *Paleontological resources are ignored*.
A paleontological resource stipulation (CSU-12) was added to Alternative C (Section 2.3) and the affected environment and environmental consequences were described (Section 3.8).

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Miles City Field Office
111 Garryowen Road
Miles City, Montana 59301-7000
www.blm.gov/mt

In Reply Refer To:

October 2014 Comp Sale
3160 (MTC023)

July 23, 2014

Dear Reader:

The Bureau of Land Management (BLM) Miles City Field Office prepared an environmental assessment (EA) to analyze the potential effects from offering 18 nominated lease parcels for competitive oil and gas leasing in a sale tentatively scheduled to occur on October 21, 2014. The EA and unsigned Finding of No Significant Impact (FONSI) were available for a 30-day public comment period.

Based on our analysis and review of comments received, the EA has been updated (refer to Chapter 5 of the EA for a summary of public comments). It will be my recommendation to offer 2 whole and 5 partial lease parcels, 1,197.34 surveyed Federal mineral acres, along with stipulations and/or lease notices identified in the BLM preferred alternative in the updated EA (see Appendix A). It is also my recommendation to defer 11 whole and 5 partial lease parcels in whole, 6,747.94 surveyed Federal mineral acres for further review and analysis.

We anticipate preparing and finalizing our Decision Record after the oil and gas lease sale, but prior to lease issuance. Upon finalization, the Decision Record and accompanying FONSI will be posted on the website listed below.

Current and updated information about the EA, Lease Sale Notice, the parcel list with recommended stipulations, and corresponding information pertaining to this sale can be found at http://blm.gov/qtld.

If you have any questions or would like more information about lease sale notices or the issuance of the EA, Decision Record and FONSI, please contact me at 406-233-2837.

Sincerely,

Todd D. Yeager
Field Manager

BLM

United States Department of the Interior
Bureau of Land Management

Environmental Assessment DOI-BLM-MT-C020-2014-0091-EA
~~May 19, 2014~~ July 23, 2014

Project Title: Oil and Gas Lease Parcel, October 21, 2014 Sale

Location: Miles City Field Office (see Appendix A for list of lease parcels by number and legal description and Maps 1-6)

Miles City Oil and Gas Lease Sale EA
DOI-BLM-MT-C020-2014-0091-EA

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1.0 PURPOSE AND NEED

1.1 Introduction

It is the policy of the Bureau of Land Management (BLM) to make mineral resources available for use and to encourage development of mineral resources to meet national, regional, and local needs. This policy is based on various laws, including the Mineral Leasing Act of 1920 and the Federal Land Policy and Management Act of 1976. The Federal Onshore Oil and Gas Leasing Reform Act of 1987 Sec. 5102(a)(b)(1)(A) directs the BLM to conduct quarterly oil and gas lease sales in each state whenever eligible lands are available for leasing. The Montana State Office conducts mineral estate lease auctions for lands managed by the Federal Government, whether the surface is managed by the Department of the Interior (BLM or Bureau of Reclamation), United States Forest Service, or other departments and agencies. In some cases the BLM holds subsurface mineral rights on split estate lands where the surface estate is owned by another party, other than the Federal Government. Federal mineral leases can be sold on such lands as well. The Montana State Office has historically conducted five lease sales per year.

Members of the public file Expressions of Interest (EOI) to nominate parcels for leasing by the BLM. From these EOIs, the Montana State Office provides draft parcel lists to the appropriate field offices for review. The BLM field offices then review legal descriptions of nominated parcels to determine: if they are in areas open to leasing; if new information has come to light which might change previous analyses conducted during the land use planning process; if there are special resource conditions of which potential bidders should be made aware; and which stipulations should be identified and included as part of a lease. Ultimately, all of the lands in proposed lease sales are nominated by private individuals, companies, or the BLM, and therefore represent areas of high interest.

This environmental assessment (EA) has been prepared to disclose and analyze the potential environmental consequences from leasing all 18 nominated lease parcels encompassing a total of 7,945.28 surveyed Federal mineral acres located in the Miles City Field Office (MCFO), to be included as part of a competitive oil and gas lease sale tentatively scheduled to occur in October 21, 2014.

The analysis area includes the 18 nominated parcels in Richland, Roosevelt, McCone, Prairie, and Powder River counties (Map 1).

1.2 Purpose and Need for the Proposed Action

The purpose of offering parcels for competitive oil and gas leasing is to provide opportunities for private individuals or companies to explore for and develop Federal oil and gas resources in Richland, Roosevelt, McCone, Prairie, and Powder River counties after receipt of necessary approvals and to sell the oil and gas in public markets.

This action is needed to help meet the energy needs of the people of the United States. By conducting lease sales, the BLM provides for the potential increase of energy reserves for the U.S., a steady source of income, and at the same time meets the requirement identified in the Energy Policy Act, Sec. 362(2), Federal Oil and Gas Leasing Reform Act of 1987, and the Mineral Leasing Act of 1920, Sec. 17. Oil and gas companies filed Expressions of Interest (EOI) to nominate parcels for leasing by the BLM Montana. The BLM needs to respond to the EOIs by determining whether or not to recommend these lease parcels for competitive oil and gas lease sale and, if so, with any stipulations attached.

The decision to be made is whether to sell oil and gas leases on the lease parcels identified, and, if so, identify stipulations that would be included with specific lease parcels at the time of lease sale.

1.3 Conformance with Land Use Plan(s)

This EA is tiered to the information and analysis and conforms to the decisions contained in the Big Dry Resource Management Plan (RMP/EIS) of April 1996 and the Powder River RMP/EIS of March 1985, as amended (1994 Oil and Gas RMP/EIS Amendment, 2003 Final Statewide Oil and Gas Environmental Impact Statement and proposed Amendment of the Powder River and Billings RMPs, and the 2008 Final Supplement to the Montana Statewide Oil and Gas Environmental Impact Statement and Proposed Amendment of the Powder River and Billings RMPs). The Big Dry and Powder River RMPs are the governing land use plans for the MCFO. The lease parcels to potentially be offered for sale are within areas determined to be open to oil and gas leasing in the Big Dry and Powder River RMPs. An electronic copy of the Big Dry RMP/EIS and the Powder River RMP/EIS, as amended, can be located via the internet on the BLM home page, www.blm.gov/mt. On the home page, locate the heading titled "*Montana/Dakotas*," then select "*What We Do*", then click on the "*Planning*" link.

A more complete description of activities and impacts, related to oil and gas leasing, development, production, etc. can be found at pages 111 to 156 of the Big Dry RMP and pages 55 to 77 of the 1994 Oil and Gas Amendment of the Powder River RMP (for leasing decisions), and pages 4-1 to 4-310 of the 2008 Final Supplement to the Montana Statewide Oil and Gas Environmental Impact Statement and Proposed Amendment of the Powder River and Billings RMPs (for development, production, etc).

Analysis of the 18 parcels is documented in this EA, and was conducted by MCFO resource specialists who relied on professional knowledge of the areas involved, review of current databases, file information, and some site visits to ensure that appropriate stipulations were recommended for a specific parcel. Analysis may have also identified the need to defer entire or partial parcels from leasing pending further environmental review.

At the time of this review it is unknown whether a particular parcel will be sold and a lease issued. It is unknown when, where, or if future well sites, roads, and facilities might be proposed. Assessment of potential activities and impacts was based on potential well densities discerned from the Reasonably Foreseeable Development (RFD) Scenario developed for this environmental assessment (Appendix C), which is based on information contained in the MCFO RFD developed in 2005 and revised in 2012; it is an unpublished report that is available by contacting the MCFO. The RFD contains projections of the number of possible oil and gas wells that could be drilled and produced in the MCFO area and used to analyze projected wells for the 18 nominated lease parcels. Detailed site-specific analysis and mitigation of activities associated with any particular lease would occur when a lease holder submits an application for permit to drill (APD). A more complete description of mitigation, BMPs, and conditions of approval related to oil and gas lease activities can be found at pages 302-326 of the Big Dry RMP, pages 130-137 of the 1994 Oil and Gas Amendment of the Powder River RMP, pages 3-6 of the 2008 Record of Decision for the Final Supplement to the Montana Statewide Oil and Gas Environmental Impact Statement and Proposed Amendment of the Powder River and Billings RMPs, Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development-The Gold Book, and online at http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices.html. Offering the parcels for sale and issuing leases would not be in conflict with any local, county, or state laws or plans.

1.4 Public Scoping and Identification of Issues

Public scoping for this project was conducted through a 15-day scoping period advertised on the BLM Montana State Office website and posted on the MCFO website National Environmental Policy Act (NEPA) notification log. Scoping was initiated March 25, 2014.

The BLM coordinates with Montana Fish, Wildlife, and Parks (MFWP), and the United States Fish and Wildlife Service (USFWS) to manage wildlife habitat because BLM management decisions can affect wildlife populations which depend on the habitat. The BLM manages habitat on BLM lands, while MFWP is responsible for managing wildlife species populations. The USFWS also manages some wildlife populations but only those Federal trust species managed under mandates such as the Endangered Species Act, Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act. Managing wildlife is factored into project planning at multiple scales and is to be implemented early in the planning process.

Coordination with Montana Fish Wildlife and Parks (MFWP) was conducted for the 18 lease parcels being reviewed and in the completion of this EA in order to prepare the analysis, identify protective measures, and apply stipulations and lease notices associated with these parcels being analyzed. A letter was sent to the USFWS and MFWP during the 15-day scoping and 30-day public comment periods requesting comments on the 18 parcels being reviewed. Refer to Section 5.2 of this EA for a more complete summary of the scoping comments received from MFWP.

The BLM consults with Native Americans under various statues, regulations, and executive orders, including the American Indian Religious Freedom Act, the National Historic Preservation Act, the Native American Graves Protection and Repatriation Act, the National Environmental Policy Act, and Executive Order 13175-Consultation and Coordination with Indian Tribal Governments. The BLM sent letters to tribes in Montana, North and South Dakota and Wyoming for the 15-day scoping period informing them of the potential for the 18 parcels to be leased and inviting them to submit issues and concerns BLM should consider in the environmental analysis. Letters were sent to the Tribal Presidents and the Tribal Historical Preservation Officer (THPO) or other cultural contacts for the Cheyenne River Sioux Tribe, Crow Tribe of Montana, Crow Creek Sioux Tribe, Eastern Shoshone Tribe, Ft. Peck Tribes, Lower Brule Sioux Tribe, the Mandan, Hidasta, and Arkira Nation, Northern Arapaho Nation, Northern Cheyenne Tribe, Oglala Sioux Tribe, Rosebud Sioux Tribe of Indians, Standing Rock Sioux Tribe, and Turtle Mountain Band of Chippewa. In addition to scoping letters, THPOs also received file search results from the preliminary review of parcels conducted by BLM. The BLM sent a second letter with a copy of the EA to the tribes informing them about the 30 day public comment period for the EA and solicit any information BLM should consider before making a decision whether to offer any or all of the nominated parcels for sale.

Site specific resource concerns were identified by the BLM through the preliminary review process conducted prior to a 15-day public scoping period. Lease stipulations (as required by Title 43 Code of Federal Regulations 3131.3) were added as necessary to each parcel as identified by the BLM to address site specific resource concerns.

The BLM focuses its analysis on issues that are truly significant to the action in question, rather than amassing needless detail" (40 CFR 1500.1(b)). Issues have a relationship with the proposed action; are within the scope of analysis; and are amenable to scientific analysis.

The issues carried forward through analysis in this EA are associated with air resources, greenhouse gas emission and climate change, economic resources, socioeconomics, cultural resources, paleontological resources, water resources, recreation and visual resources, wildlife habitat, Special Status and Sensitive Species, vegetation , livestock grazing management, invasive, non-invasive species and noxious weeds,

The BLM considered other issues, listed below, but decided not to analyze those in further detail. The aspects of the existing environment that the BLM determined to not be present or not potentially impacted by this project include: coal, locatable minerals, salable minerals, lands with wilderness characteristics, cave and karst resources, wild and scenic rivers; wilderness study areas. Thus, the EA contains no further discussion of these issues.

2.0 DESCRIPTION OF ALTERNATIVES, INCLUDING PROPOSED ACTION

2.1 Alternative A - No Action

For EAs on externally initiated Proposed Actions, the No Action Alternative generally means that the Proposed Action would not take place. In the case of a lease sale, this would mean that all expressions of interest to lease (parcel nominations) would be denied or rejected.

The No Action Alternative would exclude all 18 lease parcels, covering 7,945.28 surveyed Federal mineral acres (3,637.97 surveyed BLM administered surface and 4,307.31 surveyed private/State surface), from the competitive oil and gas lease sale (Maps 1-6). Surface management would remain the same and ongoing oil and gas development would continue on surrounding Federal, private, and State leases.

2.2 Alternative B – Proposed Action

The Proposed Action Alternative would be to offer 18 lease parcels of Federal minerals for oil and gas leasing, covering 7,945.28 surveyed Federal mineral acres (3,637.97 surveyed BLM administered surface and 4,307.31 surveyed private surface), in conformance with the existing land use planning decisions. Parcel number, size, and detailed locations and associated stipulations are listed in Appendix A. Maps 1-6 indicate the detailed location of each parcel.

2.3 Alternative C -BLM Preferred

Under the BLM Preferred Alternative, 2 whole and 5 partial parcels of the 18 lease parcels, ~~1,396.87~~ 1,197.34 surveyed Federal mineral acres (~~680~~ 481.21 surveyed BLM administered surface and ~~716.87~~ 716.13 surveyed private surface) would be offered with RMP lease stipulations and/or lease notices as necessary (Appendix A) for competitive oil and gas lease sale and lease issuance.

A total of 11 lease parcels in whole and 5 partial lease parcels, encompassing ~~6,549.15~~ 6,747.94 surveyed Federal mineral acres (~~2,958.73~~ 3,157.52 surveyed BLM administered surface and 3,590.42 private surveyed surface), are recommended for deferral (Maps 7-11). These lease parcels contain sage grouse, big game winter range, badlands rock outcrop, and sensitive soil protection areas being analyzed in the current MCFO RMP effort; therefore, 11 whole lease parcels and 5 partial lease parcels would be deferred at this time pending further review and analysis. This would provide for consideration of alternatives in the current MCFO RMP planning.

2.4 Additional Considerations for Alternatives B and C

For the split-estate lease parcels, the BLM provided courtesy notification to private landowners that the Federal oil and gas estate under their surface would be included in this lease sale. In the event of activity on such split estate lease parcels, the lessee and/or operator would be responsible for adhering to BLM requirements as well as reaching an agreement with the private surface landowners regarding access, surface disturbance, and reclamation.

The terms and conditions of the standard federal lease and federal regulations would apply to each parcel offered for sale in each of the two Alternatives. Stipulations shown in Appendix A would be included with identified parcels offered for sale. Standard operating procedures for oil and gas operations on federal leases include measures to protect the environment and resources such as groundwater, air, wildlife, historical and prehistorical concerns, and others as mentioned in the Big Dry and Powder River RMPs at pages 9 to 40 and 302 to 330 of the Minerals Appendix (Big Dry) and 2-1 to 2-28 and the Minerals Appendix Min-36 to Min-42 (2008 Final Supplement to the Montana Statewide Oil and Gas EIS and Proposed Amendment of the Powder River and Billings RMPs). Conditions of Approval (COAs) would be attached to permits issued to explore and develop the parcels to address site-specific concerns or new information. Standard operating procedures, best management practices (BMPs), COAs, and lease stipulations can change over time to meet RMP objectives, resource needs or land use compatibility.

Federal oil and gas leases would be issued for a 10-year period and would remain valid for as long thereafter as oil or gas is produced in paying quantities, required payments are made and lease operations are conducted in compliance with regulations and approved permits. If a lessee fails to produce oil and gas by the end of the initial 10 year period, does not make annual rental payments, or does not comply with the terms and conditions of the lease, the BLM would terminate the lease. The lessee can relinquish the lease. The oil and gas resources could be offered for sale at a future lease sale.

Drilling of wells on a lease would not be permitted until the lessee or operator secures approval of a drilling permit and a surface use plan as specified in 43 CFR 3162.

3.0 AFFECTED ENVIRONMENT

3.1 Introduction

This chapter describes the existing environment (i.e., the physical, biological, social, and economic values and resources) within the analysis area, which includes the 18 nominated parcels in Richland, Roosevelt, McCone, Prairie, and Powder River counties (Map 1), that could be affected by implementation of the alternatives described in Chapter 2.

The existing environment is described by the different resources found throughout the counties listed above. Within each resource description, lease parcels containing the resource will be listed and analyzed further in Chapter 4. If the lease parcel does not contain the resource, then the lease parcel will be omitted from the description of that specific resource.

Unless otherwise stated, resource analysis in this chapter, and Chapter 4, will be described in approximate acres due to the scaling and precision parameters associated with the Geographic Information System (GIS), in addition to being referenced to a different land survey.

Most of the analysis area consists of open expanses characteristic of the Northern Great Plains. This area is largely comprised of herbaceous vegetation (e.g., grasses) with interspersed shrubs (e.g., sagebrush). Lands with greater moisture or slopes exhibit ponderosa pine, limber pine, limited Douglas fir, and juniper species. Some hardwood trees grow along riparian areas and are common along the Missouri River. The analysis area experiences extreme weather variations on a yearly basis due to its semiarid continental climate. Most of the public lands are scattered throughout the analysis area. The public lands are rich in natural resources, such as wildlife and livestock forage, minerals, cultural resources, paleontological resources, recreation opportunities, and watershed values.

3.2 Air Resources

Air resources include air quality, air quality related values (AQRVs), and climate change. As part of the planning and decision making process, BLM considers and analyzes the potential effects of BLM and BLM-authorized activities on air resources.

The Environmental Protection Agency (EPA) has the primary responsibility for regulating air quality, including seven criteria air pollutants subject to National Ambient Air Quality Standards (NAAQS). Pollutants regulated under NAAQS include carbon monoxide (CO), lead, nitrogen dioxide (NO_2), ozone, particulate matter with a diameter less than or equal to 10 microns (PM_{10}), particulate matter with a diameter less than or equal to 2.5 microns ($PM_{2.5}$), and sulfur dioxide (SO_2). Two additional pollutants, nitrogen oxides (NO_x) and volatile organic compounds (VOCs) are regulated because they form ozone in the atmosphere. Regulation of air quality is also delegated to some states. Air quality is determined by pollutant emissions and emission characteristics, atmospheric chemistry, dispersion meteorology, and terrain. AQRVs include effects on soil and water, such as sulfur and nitrogen deposition and lake acidification, and aesthetic effects, such as visibility.

Climate is the composite of generally prevailing weather conditions of a particular region throughout the year, averaged over a series of years. Climate change includes both historic and predicted climate shifts that are beyond normal weather variations.

3.2.1 Air Quality

The EPA air quality index (AQI) is an index used for reporting daily air quality (http://www.epa.gov/oar/data/geosel.html) to the public. The index tells how clean or polluted an area's air is and whether associated health effects might be a concern. The EPA calculates the AQI for five criteria air pollutants regulated by the Clean Air Act (CAA): ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established NAAQS to protect public health. An AQI value of 100 generally corresponds to the primary NAAQS for the pollutant. The following terms help interpret the AQI information:

- **Good –** The AQI value is between 0 and 50. Air quality is considered satisfactory and air pollution poses little or no risk.
- **Moderate –** The AQI is between 51 and 100. Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people. For example, people who are unusually sensitive to ozone may experience respiratory symptoms.
- **Unhealthy for Sensitive Groups –** When AQI values are between 101 and 150, members of "sensitive groups" may experience health effects. These groups are likely to be affected at lower levels than the general public. For example, people with lung disease are at greater risk from exposure to ozone, while people with either lung disease or heart disease are at greater risk from exposure to particle pollution. The general public is not likely to be affected when the AQI is in this range.
- **Unhealthy –** The AQI is between 151 and 200. Everyone may begin to experience some adverse health effects, and members of the sensitive groups may experience more serious effects.
- **Very Unhealthy –** The AQI is between 201 and 300. This index level would trigger a health alert signifying that everyone may experience more serious health effects.

AQI data show that there is little risk to the general public from air quality in the analysis area (Table 1). Based on available 2010–2012 data for Richland County in the northern portion of the planning area, 88 percent of the days were rated "good" and the three-year median daily AQI was 35. In the southern portion of the planning area, 2010–2012 data for Powder River County indicated that 82 percent of the days were rated good and the three-year median daily AQI was 37.

Table 1. US EPA – Air Data Air Quality Index Report (2010–2012)

County[1]	# Days in Period	# Days Rated Good or No Data	Percent of Days Rated Good or No Data	# Days Rated Moderate	# Days Rated Unhealthy for Sensitive Groups	# Days Rated Unhealthy	# Days Rated Very Unhealthy
Powder River	1,092	898	82%	194	0	0	0
Richland	1,096	968	88%	128	0	0	0

[1]The Powder River and Richland County monitors are located near Broadus and Sidney, respectively.
Source: EPA 2013b.

The area managed by the MCFO is in compliance with all NAAQS. Based on monitoring data available for 2010 through 2012, maximum concentrations as a percentage of the NAAQS are summarized in Table 2. Data are not provided for CO and lead which are not monitored within the analysis area.

Table 2. Monitored Concentrations Representative of the Study Area [a]

Pollutant	Averaging Time	Applicable Standard [b]	Concentration [d]	
			Powder River County	Richland County
NO2	1 hour	100 ppb	16 ppb (16%)	9 ppb (9%)
O3	8 hour	0.075 ppm	0.055 ppm (73%)	0.057 ppm (76%)
PM10	24 hour	150 μg/m^3	100 μg/m^3 (67%)	100 μg/m^3 (67%)
PM2.5	24 hour	35 μg/m^3	16 μg/m^3 (46%)	15 μg/m^3 (43%)
	Annual	12 μg/m^3	6 μg/m^3 (51%)	7 μg/m^3 (55%)
SO_2	1 hour	75 ppb	N/A	5 ppb (7%)
	24 hour	140 ppb	N/A	1 ppb (21%)

[a] Representative concentrations are based on data from the Sidney monitoring station in Richland County and the Broadus monitor in Powder River County.
[b] Most restrictive national or State standard.
[c] Monitored concentrations are the 2nd highest for 24-hour PM_{10} and 24-hour SO_2; three-year average of the annual 4th highest daily maximum for 8-hour O3; three-year average of the 98th percentile for 24-hour $PM_{2.5}$ and 1-hour NO_2; and three-year arithmetic mean for annual PM2.5.
[d] Values in parentheses are monitored concentrations as a percentage of the most restrictive applicable standard.
Source: EPA 2013b.

Although ozone concentrations above the NAAQS have been monitored in some rural areas in other states with oil and gas activity, moderate ozone concentrations have been monitored in Montana oil and gas areas. Based on 2010-2012 data from monitors located near Sidney and Broadus, Montana, ozone concentrations are approximately 75 percent of the ozone NAAQS (MDEQ 2013).

Hazardous air pollutants (HAPs) would also be emitted from oil and gas operations, including well drilling, well completion, and gas and oil production. Recent air quality modeling performed for the MCFO indicates that concentrations of benzene, ethylbenzene, formaldehyde, n-hexane, toluene, and xylene would be less than 14 percent of applicable health-based standards and that the additional risk of cancer would be less than 0.18 in one million (BLM 2013).

Air resources also include visibility, which can be degraded by regional haze due in part to sulfur, nitrogen, and particulate emissions. Based on trends identified during 2005-2009, visibility has degraded slightly at the Medicine Lake National Wildlife Refuge IMPROVE monitor in Sheridan County on the haziest days (20 percent worse days). On the 20 percent best (clearest) days, visibility at this monitor has been improving, as shown by decreasing haze in Figure A.

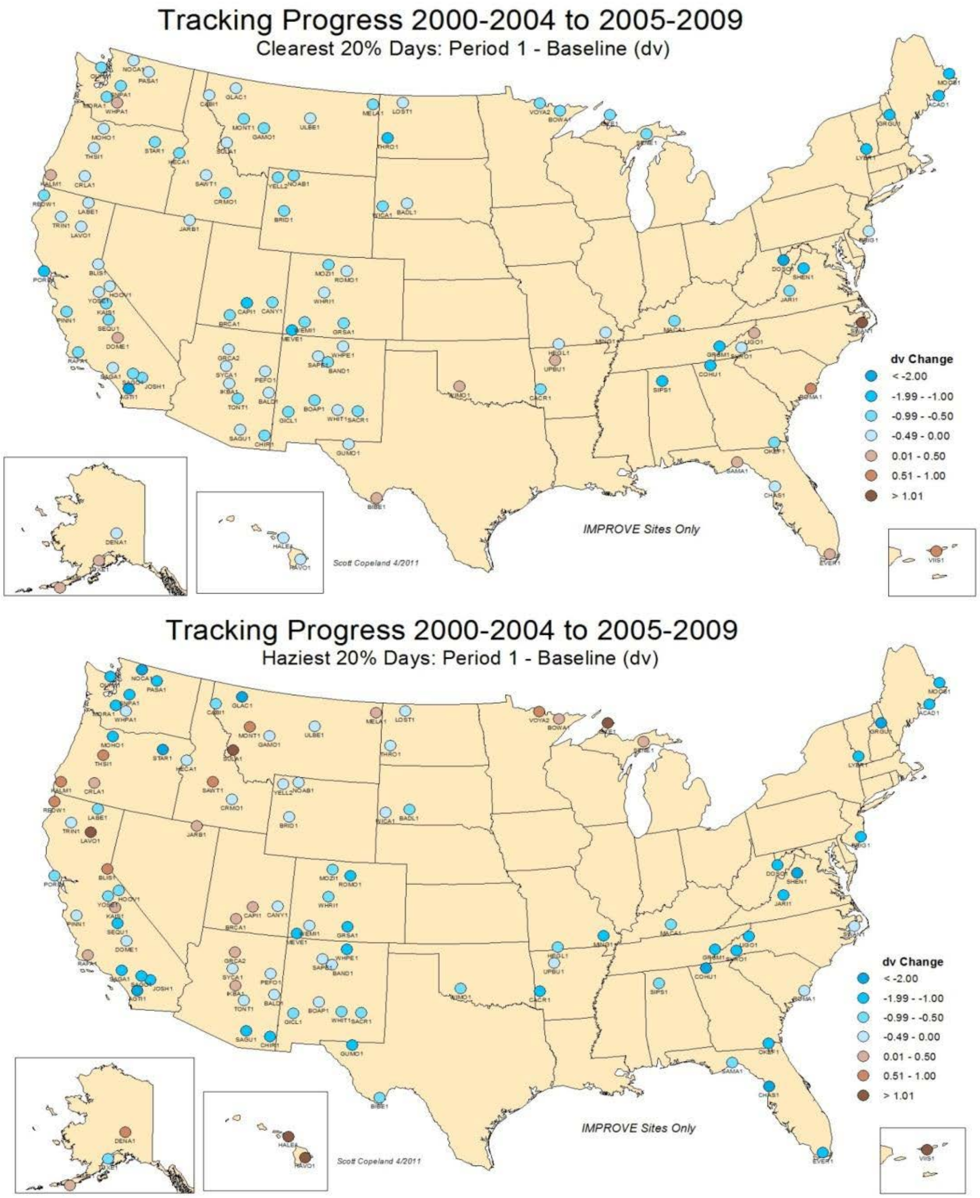

Figure A. Trends in haze index (deciview) on haziest and clearest days, 2005-2009. Source: IMPROVE 2011.

3.2.2 Climate Change

Climate change is defined by the Intergovernmental Panel on Climate Change (IPCC) as "a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use." (IPCC 2013). Climate change and climate science are discussed in detail in the climate change Supplementary Information Report for Montana, North Dakota, and South Dakota, Bureau of Land Management (Climate Change SIR 2010). This document is incorporated by reference into this EA.

The IPCC states: "Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased." (IPCC 2013). The global average surface temperature has increased approximately 1.5°F from 1880 to 2012 (IPCC 2013). Warming has occurred on land surfaces, oceans and other water bodies, and in the troposphere (lowest layer of earth's atmosphere, up to 4-12 miles above the earth). Other indications of global climate change described by the IPCC (Climate Change SIR 2010) include:

- Rates of surface warming increased in the mid-1970s and the global land surface has been warming at about double the rate of ocean surface warming since then;
- Eleven of the last 12 years rank among the 12 warmest years on record since 1850;
- Lower-tropospheric temperatures have slightly greater warming rates than the earth's surface from 1958-2005.

As discussed and summarized in the climate change SIR, earth has a natural greenhouse effect wherein naturally occurring gases such as water vapor, CO_2, methane, and N_2O absorb and retain heat. Without the natural greenhouse effect, earth would be approximately 60°F cooler (Climate Change SIR 2010). Current ongoing global climate change is caused, in part, by the atmospheric buildup of greenhouse gases (GHGs), which may persist for decades or even centuries. Each GHG has a global warming potential that accounts for the intensity of each GHG's heat trapping effect and its longevity in the atmosphere (Climate Change SIR 2010). The buildup of GHGs such as CO_2, methane, N_2O, and halocarbons since the start of the industrial revolution has substantially increased atmospheric concentrations of these compounds compared to background levels. At such elevated concentrations, these compounds absorb more energy from the earth's surface and re-emit a larger portion of the earth's heat back to the earth rather than allowing the heat to escape into space than would be the case under more natural conditions of background GHG concentrations.

A number of activities contribute to the phenomenon of climate change, including emissions of GHGs (especially CO_2 and methane) from fossil fuel development, large wildfires, activities using combustion engines, changes to the natural carbon cycle, and changes to radiative forces and reflectivity (albedo). It is important to note that GHGs will have a sustained climatic impact over different temporal scales due to their differences in global warming potential (described above) and lifespans in the atmosphere. For example, CO_2 may last 50 to 200 years in the atmosphere while methane has an average atmospheric life time of 12 years (Climate Change SIR 2010).

With regard to statewide GHG emissions, Montana ranks in the lowest decile when compared to all the states (http://assets.opencrs.com/rpts/RL34272_20071205.pdf, Ramseur 2007). The estimate of Montana's 2005 GHG emissions of 37 million metric tons (MMt) of gross consumption-based carbon dioxide equivalent (CO_2e) account for approximately 0.6 percent of the U.S. GHG emissions (CCS 2007).

Some information and projections of impacts beyond the project scale are becoming increasingly available. Chapter 3 of the climate change SIR describes impacts of climate change in detail at various scales, including the state scale when appropriate. The EPA identifies eastern Montana as part of the Great Plains region. The following summary characterizes potential changes identified by the EPA (EPA 2008) that are expected to occur at the regional scale, where the Proposed Action and its alternatives are to occur.

- The region is expected to experience warmer temperatures with less snowfall.
- Temperatures are expected to increase more in winter than in summer, more at night than in the day, and more in the mountains than at lower elevations.
- Earlier snowmelt means that peak stream flow would be earlier, weeks before the peak needs of ranchers, farmers, recreationalist, and others. In late summer, rivers, lakes, and reservoirs would be drier.
- More frequent, more severe, and possibly longer-lasting droughts are expected to occur.
- Crop and livestock production patterns could shift northward; less soil moisture due to increased evaporation may increase irrigation needs.
- Drier conditions would reduce the range and health of ponderosa and lodgepole pine forests, and increase the susceptibility to fire. Grasslands and rangelands could expand into previously forested areas.
- Ecosystems would be stressed and wildlife such as the mountain lion, black bear, long-nose sucker, marten, and bald eagle could be further stressed.

Other impacts could include:
- Increased particulate matter in the air as drier, less vegetated soils experience wind erosion.
- Shifts in vegetative communities which could threaten plant and wildlife species.
- Changes in the timing and quantity of snowmelt which could affect both aquatic species and agricultural needs.

Projected and documented broad-scale changes within ecosystems of the U.S. are summarized in the Climate Change SIR. Some key aspects include:
- Large-scale shifts have already occurred in the ranges of species and the timing of the seasons and animal migrations. These shifts are likely to continue (USGCRP 2009, as cited by Climate Change SIR 2010). Climate changes include warming temperatures throughout the year and the arrival of spring an average of 10 days to 2 weeks earlier through much of the U.S. compared to 20 years ago. Multiple bird species now migrate north earlier in the year.

- Fires, insect epidemics, disease pathogens, and invasive weed species have increased and these trends are likely to continue. Changes in timing of precipitation and earlier runoff would increase fire risks.
- Insect epidemics and the amount of damage that they may inflict have also been on the rise. The combination of higher temperatures and dry conditions have increases insect populations such as pine beetles, which have killed trees on millions of acres in western U.S. and Canada. Warmer winters allow beetles to survive the cold season, which would normally limit populations; while concurrently, drought weakens trees, making them more susceptible to mortality due to insect attack.

More specific to Montana, additional projected changes associated with climate change described in Section 3.0 of the Climate Change SIR (2010) include:

- Temperature increases in Montana are predicted to be between 3 to 5°F at the mid-21st century. As the mean temperature rises, more heat waves are predicted to occur.
- Precipitation increases in winter and spring in Montana may be up to 25 percent in some areas. Precipitation decreases of up to 20 percent may occur during summer, with potential increases or decreases in the fall.
- For most of Montana, annual median runoff is expected to decrease between 2 and 5 percent. Mountain snowpack is expected to decline, reducing water availability in localities supplied by meltwater.
- Wind power production potential is predicted to decline in Montana based on modeling focused on the Great Falls area.
- Water temperatures are expected to increase in lakes, reservoirs, rivers, and streams. Fish populations are expected to decline due to warmer temperatures, which could also lead to more fishing closures.
- Wildland fire risk is predicted to continue to increase due to climate change effects on temperature, precipitation, and wind. One study predicted an increase in median annual area burned by wildland fires in Montana based on a 1°C global average temperature increase to be 241 to 515 percent.

While long-range regional changes might occur within this analysis area, it is impossible to predict precisely when they could occur. The following example summarizing climate data for northeastern Montana (Montana Climate Division 6) illustrates this point. A potential regional effect of climate change is earlier snowmelt and associated runoff. This is directly related to spring-time temperatures. Over a 118-year record, overall warming is clearly evident with temperatures increasing 0.2°F per decade (Figure B). Similar temperature increases occurred in southeastern Montana (Montana Climate Division 7).

However, data from 1991-2005 indicate a cooling trend of -1.3 degrees per decade (Figure C) in the northern and southern portions of the MCFO. This example is not an anomaly, as several other 15-year windows can be selected to show either warming or cooling trends. Substantial year-to-year fluctuations in temperature are due to natural processes, such as the effects of El Niños, La Niñas, and the eruption of large volcanoes (Climate Change SIR 2010). Annual fluctuations illustrate the difficulty of predicting actual short-term regional changes or conditions which may be due to climate change during any specific time frame.

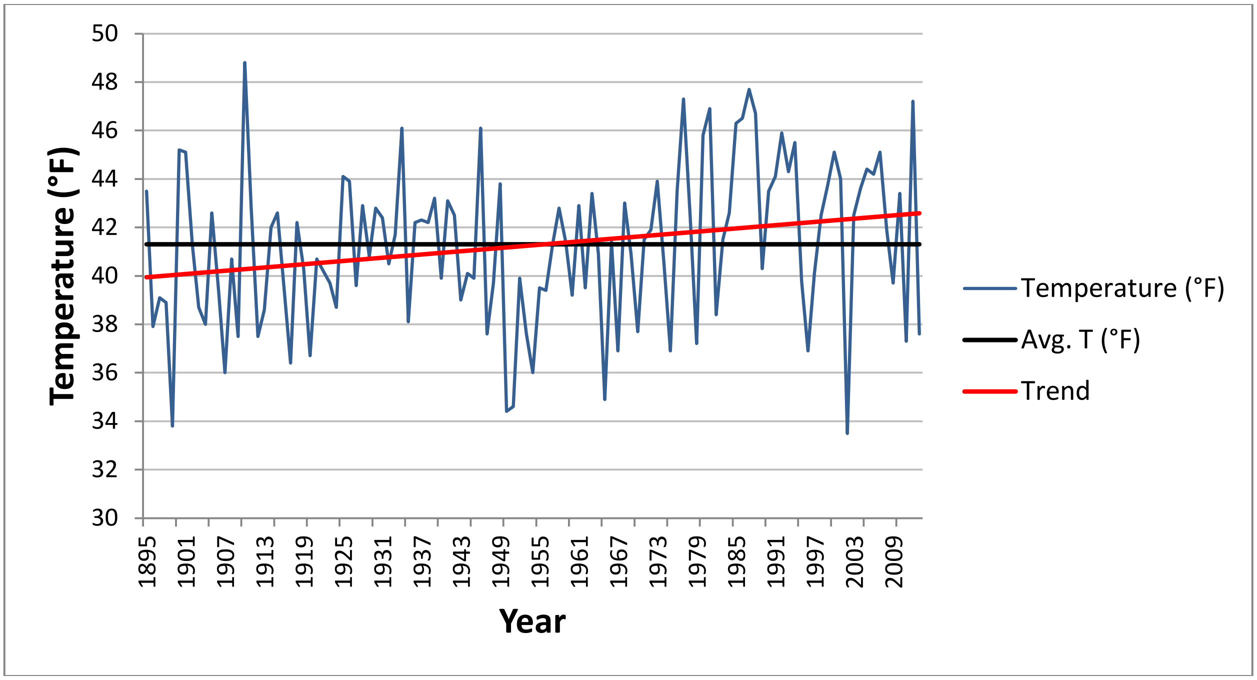

Figure B. Northeastern Montana spring temperatures (March-May, 1895-2013). (Source: National Climatic Data Center (NCDC) website – http://www.ncdc.noaa.gov/cag/)

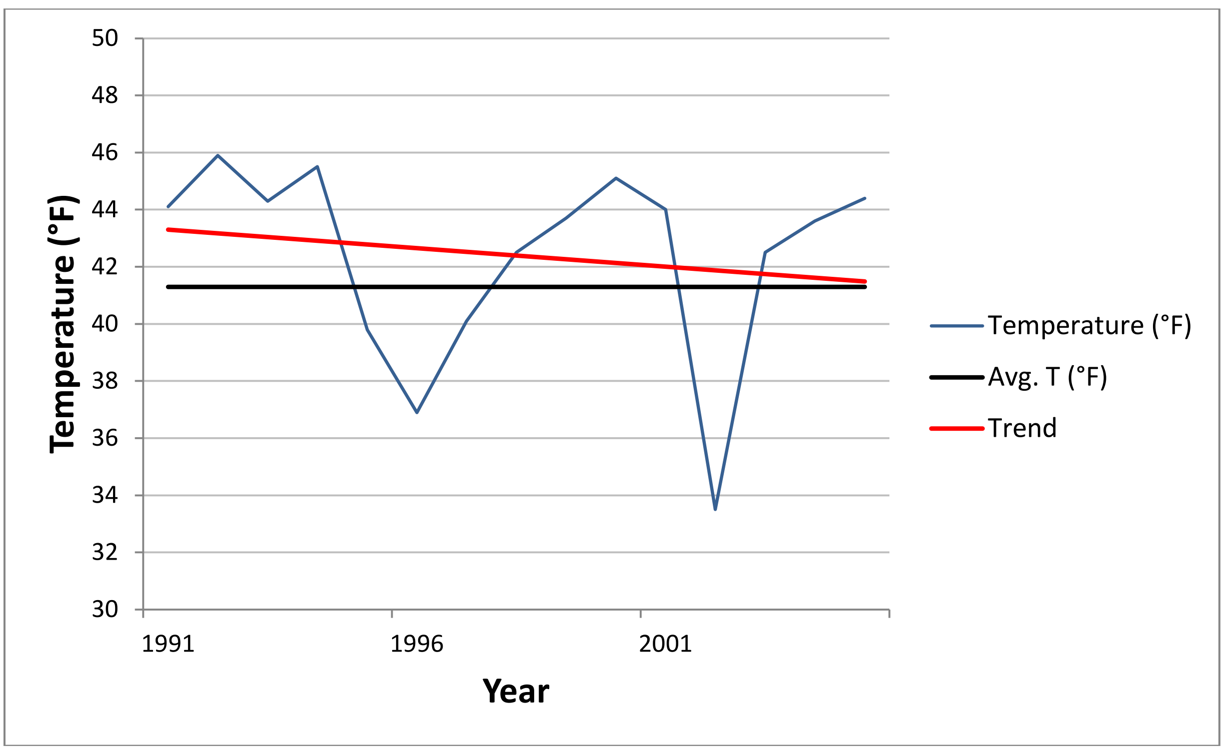

Figure C. Northeastern Montana spring temperatures (March-May, 1991-2005). (Source: National Climatic Data Center (NCDC) website – http://www.ncdc.noaa.gov/cag/)

From 1895–2013, annual precipitation decreased 0.06 inches per decade in the northern portion of the MCFO, while precipitation remained relatively constant in the southern portion. Throughout the MCFO, precipitation trends show increased during spring and fall seasons, while precipitation decreased during summer and winter.

3.3 Soil Resources

The soil-forming factors (climate, parent material, topography, biota, and age) are variable across the planning area, which results in soils with diverse physical, chemical, and biotic properties. Important properties of naturally functioning soil systems include biotic activity, diversity, and productivity; water capture, storage, and release; nutrient storage and cycling; contaminant filtration, buffering, degradation, immobilization, and detoxification; and biotic system habitat.

The lease parcels are located within 5 counties including Prairie, Roosevelt, Richland, Powder River, and McCone. The acreage of the lease parcels comprises less than 1 percent of each county. Soils considered prime farmlands if irrigated occur within lease parcels MTM 102757-WT, MTM 105431-HB, MTM 105431-HD, MTM 105431-HF, MTM 105431-HG, MTM 105431-HH, MTM 105431-HJ, MTM 105431-HK, MTM 105431-HL, and MTM 105431-HM. The following describes the common soil properties of lease parcels within each county:

Prairie County contains proposed parcels MTM 102757-WT and MTM 102757-WW. Parcel soils generally developed from the Fort Union Formation. Ecological sites within these parcels fall within MLRA 58A, 14-19 p. z. It is an area of old plateaus and terraces that have been eroded. Slopes generally are gently rolling to steep and wide belts of steeply sloping badlands. In some areas flat-topped, steep-sided buttes rise sharply above the general level of the plains. Most of soils in the parcels are rated high for soil restoration potential with a small percentage approximately 10 to 15 percent being rated low.

Roosevelt County contains proposed parcels MTM 105431-H9 and MTM 105431-JA. Parcel soils generally developed from the Fort Union Formation. Ecological Site Descriptions for these parcels are found with MLRA 53A, 14-18 p. z. Terrain in the Northern Dark Brown Glaciated Plains are gently undulating to rolling till plains in this area are interrupted by more strongly rolling and steep slopes adjacent to kettle holes, kames, moraines, and major stream valleys. All soils within these parcels are rated high for Soil Restoration Potential.

Richland County contains proposed parcels MTM 105431-HB, MTM 105431-H6 and MTM 105431-H8. Parcel soils generally developed from the Fox Hills, Hell Creek and Fort Union Formations. Ecological sites are typical of MLRA 53A, 14-18 p. z. or MLRA 58A, 14-18 p.z. Soils in these parcels are rated moderate to high for Soil Restoration Potential.

Powder River County contains proposed parcels MTM 105431-HC, MTM 105431-HD, MTM 105431-HE, MTM 105431-HF, MTM 105431-HG, MTM 105431-HH, MTM 105431-HK, MTM 105431-HL, MTM 105431-HM and MTM 105431-HJ. Parcel soils generally developed from the Fort Union Formation. Ecological sites within these parcels fall within MLRA 58B, 14-18 p. z. Slopes generally are gently rolling to steep and wide belts of steeply sloping badlands. In some areas flat-topped, steep-sided buttes rise sharply above the general level of the plains.

Most of the soils are rated moderate to high for Soil Restoration Potential with a smaller percentage being rated low.

McCone County contains proposed parcels MTM 105431-HA. Soils generally developed from Hell Creek and Fort Union Formations. Ecological Site Descriptions for these parcels are found with MLRA 53A, 14-18 p. z. Terrain in the Northern Dark Brown Glaciated Plains are gently undulating to rolling till plains in this area are interrupted by more strongly rolling and steep slopes adjacent to kettle holes, kames, moraines, and major stream valleys. Soils in this parcel are rated high for Soil Restoration Potential however some have not been rated.

3.4 Water Resources

3.4.1 Surface Hydrology

Surface water resources across the MCFO are present as lakes, reservoirs, rivers, streams, wetlands, and springs. Water resources are essential to the residents of eastern Montana to support agriculture, public water supplies, industry, and recreation. Water resources and riparian areas are crucial to the survival of many BLM-sensitive fish, reptiles, birds, and amphibians.

Perennial streams retain water year-round and have variable flow regimes. Intermittent streams flow during the part of the year when they receive sufficient water from springs, groundwater, or surface sources such as snowmelt or storm events. Ephemeral streams flow only in direct response to precipitation. Intermittent and ephemeral streams play an important role in the hydrologic function of the ecosystems within the lease parcels by transporting water, sediment, nutrients, and debris and providing connectivity within a watershed. They filter sediment, dissipate energy from snowmelt and storm water runoff, facilitate infiltration, and recharge groundwater (Levick et al. 2008). The pools of intermittent streams retain water in the summer months, supporting riparian vegetation and providing water resources for wildlife and livestock.

Stream morphology is influenced by a number of factors including: stream flow regime, geology, soils, vegetation type, climate, and land use history. Stream conditions reflect a number of historic and current impacts, ranging from agriculture to mining. Surficial geology is generally represented by Tertiary sandstones, siltstones, and shales, with some alluvium and glacial till which tends to form fine grain soils (loams to clays), that are highly erosive. Streambeds consist typically of sand and silt, with few bedrock channels. Stream morphology is highly influenced by the presence and type of riparian vegetation because streambeds and stream banks generally lack control features (e.g., rocks, cobles, bedrock).

Approximately 90 acres of 100-year floodplains are present within 5 of the proposed lease parcels. These floodplains are generally associated with Crow Rock Creek and various unnamed intermittent streams. Floodplain function is essential to watershed function, water quality, soil development, stream morphology, and riparian-wetland community composition. Floodplains reduce flood peaks and velocities, thereby reducing erosion; enhancing nutrient cycling; reducing frequency and duration of low flows; and increasing infiltration, water storage, and aquifer recharge. Floodplains enhance water quality by facilitating sedimentation and filtering overland flow. Floodplains support high plant productivity, high biodiversity, and habitat for wildlife.

The lease parcels are located within 5 watersheds [HUC 8 (Hydrological Unit Code); subbasins]: Big Muddy Creek (HUC 10060006), Charlie-Little Muddy Creeks (HUC 10060005), Little Dry Creek (HUC 10040106), Little Powder River (HUC 10090208), and Redwater River (HUC 10060002). The acreage of the lease parcels comprises between less than 0.1 percent and 0.36 percent of each watershed (USGS 2009).

The Big Muddy watershed contains proposed parcels MTM 105431-H9 and JA; comprising less than 0.1 percent of the watershed. The lease parcels are located in Roosevelt County. The Charlie-Little Muddy Creeks watershed contains proposed parcels MTM 105431-HB, H6, and H8; comprising 0.15 percent of the watershed. The lease parcels are located in Richland County. The Little Dry Creek watershed contains proposed parcels MTM 102757-WT and WW; comprising 0.24 percent of the watershed. The parcels are located in Prairie County. The Little Powder River contains proposed parcels MTM 105431-HC, HD, HE, HF, HG, HH, HJ, HK, HL, and HM; comprising 0.36 percent of the watershed. The lease parcels are located in Powder River County. The Redwater River watershed contains proposed parcel MTM 105431-HA; comprising less than 0.1 percent of the watershed. The lease parcel is located in McCone County. Any beneficial use of produced water requires water rights to be issued by Montana Department of Natural Resources and Conservation (MDNRC) as established by law. Water used for oil well development may come from several different sources. It may be purchased from municipalities under certain conditions, appropriated from a surface water source under a new appropriation or by making changes to an existing water right, or by extracting groundwater from either a permitted or exempt well.

3.4.2 Groundwater

The quality and availability of groundwater varies greatly across the region. Residents in eastern Montana commonly get their ground water from aquifers consisting of unconsolidated, alluvial valley-fill materials, glacial outwash, or consolidated sedimentary rock formations and some coal beds.

Alluvial aquifers within the area generally consist of Quaternary alluvium and undifferentiated Quaternary/Tertiary sediments, which include sand and gravel deposits. Alluvial aquifers occur in terrace deposits and within the floodplains, and along the channels of larger streams, tributaries, and rivers, and are among the most productive sources of groundwater. They are typically 0-40 feet thick. The quality of groundwater from alluvial aquifers is generally good, but can be highly variable [approximately 100 mg/l to 2,800 mg/l TDS, specific conductance (SC) of 500 to 125,000 microsiemens/centimeter (uS/cm), and sodium adsorption ratio (SAR) of 5.0 to 10]. Wells completed in coarse sand and gravel alluvial aquifers can yield as much as 100 gallons per minute (gpm), although the average yield is 15 gpm. Alluvial deposits associated with abandoned river channels or detached terraces are topographically isolated and have limited saturation and yield as much as 20 gpm (Zelt et al. 1999).

Within the analysis area, the primary bedrock aquifers occur in sandstones and coal beds of the Tertiary Fort Union Formation (Cenozoic rocks) and the sandstones of the Cretaceous Hell Creek and Fox Hills formations (Mesozoic rocks). Wells within the Fort Union formation aquifers are typically 100 to 200 feet deep, but can be up to 1,500 feet in depth. These wells may produce as much as 40 gpm, but yields of 15 gpm are typical. Where aquifers are confined and artesian conditions exist, wells in the Fort Union Formation will generally flow less than 10 gpm. Well depths within the Hells Creek and Fox Hills formation aquifers are highly variable, but typically range from 200 to 1,000 feet in depth. Groundwater yields from these aquifers may be as much as 200 gpm, but are generally less than 100 gpm. Artesian wells within these aquifers may flow as high as 20 gpm (Zelt et al. 1999). Groundwater yields from the deeper Paleozoic Madison formation aquifer can range from 20 to 6,000 gpm, or can be higher, in karst areas. The depth to the Madison formation aquifer in the planning area can exceed 6,000 feet. Due to the extreme depth of this aquifer, it is rarely accessed for water use. Water quality of this aquifer is highly variable and is dependent on depth, bedrock type, recharge rate, and other factors.

3.5 Vegetation Resources

The vegetation within the analysis area is characteristic of the Eastern Sedimentary Plains of Montana in the 10 to 14-inch precipitation zone and the Northern Dark Brown Glaciated Plains in the 10 to 14-inch precipitation zone, which lie within the Northern Great Plains. The Northern Great Plains is known for its diverse vegetation types, soil types, and topography. Vegetation is comprised of both tall and short grasses as well as both warm and cool season grasses. A variety of grass-like plants, forbs, shrubs and trees also add to the vegetation diversity of this rangeland type. Plant species diversity increases in woody draws and riparian/wetland zones.

Existing influences on local distribution of plant communities include soils, topography, surface disturbance, availability of water, management boundary fence lines, and soil salinity. Vegetation communities have been affected by human activities for over a century. Some of these activities include: infrastructure developments (roads, powerlines, pipelines, etc.), chemical applications, logging, livestock grazing, farming, and wildfire rehabilitation, prevention, manipulation, and suppression.

The BLM Standards of Rangeland Health (Standards) for BLM administered lands address upland health, riparian health, air quality, water quality, and habitat for native plants and animals. Meeting these Standards ensures healthy, productive, and diverse vegetative resources on public lands. The BLM's policy for implementing the Standards for Rangeland Health (43 CFR §4180.2) provides that all uses of public lands are to complement the established rangeland standards. Application of 43 CFR §4180.2 provides the mechanism to adjust livestock grazing to meet or progress towards meeting Standards for Rangeland Health. Effects of other uses such as oil and gas development or off- highway vehicle use are evaluated against the Standards to provide rationale directing management of these uses.

Six vegetation communities have been identified within the analysis area: native mixed grass prairie, sagebrush/mixed grasslands, ponderosa pine-mixed grassland, agricultural lands, improved or restored pastures, and riparian-wetlands.

There are numerous ecological sites identified within the analysis area, but the primary ones include the following; Sandy (Sy), Shallow (Sw), Silty (Si), Clayey (Cy) and Overflow (Ov). The total dry-weight production expected to be found on these sites during a normal growing season ranges from approximately 800 to 1,500 lbs. /acre.

The native mixed grassland community is dominated by perennial grasses. Perennial grasses can be both warm season and cool season grasses. These perennial grasses can also be both tall and short grasses. Some of the more common grasses include western wheatgrass **(***Pascopyrum smithii*), needle-and-thread (*Hesperostipa 18rostr*), green needlegrass (*Nassella viridula*), blue grama (*Bouteloua gracilis*), and prairie junegrass (*Koeleria macrantha)*. Various forbs and shrubs are present but, occur as a minor species composition component throughout the community.

The sagebrush/ mixed grassland community occurs on lower valley slopes near drainages, especially where soils are deeper. This community can include a combination of silver sagebrush (*Artemisia cana*) and Wyoming big sagebrush (*Artemisia 18rostrate18 ssp*. *Wyomingensis*). This setting is common throughout the analysis area. The sagebrush/grassland vegetation community has a perennial grass and forb understory, similar to the species found in a mixed native grassland community. The expected species composition on this community consists of 70-75 percent native grass species, 10-15 percent forbs, and 5-10 percent shrubs and half-shrubs.

The ponderosa pine-mixed grassland community generally occurs on moderate-to-steep upland slopes on shallow soils. Ponderosa pine is a minor component of the community canopy cover but is characteristic of the type. Fifty-two percent of canopy cover is provided by grasses, including bluebunch wheatgrass (*Pseudoroegneria spicata)*, western wheatgrass, and prairie junegrass, with forbs comprising about 41 percent of cover and 50 percent of herbaceous production. This community type is very limited within the analysis area.

Improved or restored pastures consists of cultivated areas planted with introduced grasses (crested wheatgrass, smooth brome (*Bromus inermis*), intermediate wheatgrass (*Thinopyrum intermedium*), and alfalfa (*Medicago sativa), specifically for the improved vegetation production for livestock consumption***.** This setting is limited in the analysis area.

The cultivated plant community is comprised of monocultures of crops which may include small grains, alfalfa, or other crops grown primarily as supplemental feed sources for livestock production operations. These areas have been completely disturbed from the native vegetation potentials. This setting is absent or very limited in the analysis area.

Wetland areas are defined as "areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient, and which, under normal circumstances, do support, a prevalence of vegetation adapted for life in saturated soil conditions." Riparian areas are defined as "a form of wetland transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence. Lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers and streams, glacial potholes, and the shores of lakes and reservoirs with stable water levels are typical riparian areas. Excluded are such sites as ephemeral streams or washes that do not exhibit the presence of vegetation dependent upon free water in the soil" (Prichard et. Al 1995).

Within the analysis area, riparian and wetland areas would be associated with lakes, reservoirs, potholes, springs, bogs, and wet meadows as well as ephemeral, intermittent, or perennial streams. Riparian and wetland areas are among the most productive and important ecosystems (Prichard et. Al. 1995). Characteristically, riparian and wetland areas display a greater diversity of plant, fish, wildlife, and other animal species and vegetative structure than adjoining ecosystems. Adequate, healthy riparian and wetland vegetative buffers protect associated waterbodies from accelerated erosion and sedimentation and reduce or eliminate non-point source pollution from upland areas (MDEQ 2012). Healthy riparian and wetland systems filter and purify water as it moves through the riparian-wetland zone, reduce sediment loads and enhance soil stability, provide micro-climate moderation when contrasted to temperature extremes in adjacent areas, and contribute to groundwater recharge and base flow (Eubanks, 2004).

Riparian areas are considered to be some of the most biologically diverse habitats (FSEIS 2008). Some of the more common vegetative species that occur in riparian-wetland areas include prairie cordgrass (*Spartina pectinata*), switchgrass (*Panicum virgatum*), Canada wildrye (*Elymus 19rostrate19*), American licorice (*Glycyrrhiza lepidota*), sedges (*Carex spp*.), rushes (*Juncus spp*.), willow (*Salix spp.*), chokecherry (*Prunus virginiana*), buffaloberry (*Shepherdia argentea*), cottonwood (*Populus spp.*), needleleaf sedge (*Carex duriuscula*), sandbar willow (*Salix exigua*), Nebraska sedge (*Carex nebrascensis*), softstem bulrush (*Schoenoplectus tabernaemontani*), beaked sedge (*Carex rostrata*), yellow willow (*Salix lutea*), common three-square (*Schoenoplectus pungens*), and green ash (*Fraxinus pennsylvanica*). Weedy and invasive species common to riparian areas are knapweed (*Centaurea stoebe*), leafy spurge (*Euphorbia esula*), Russian olive (*Elaeagnus augustifolia*), saltcedar (*Tamarisk ramosissima*), kochia (*Bassia 19rostrate)*, thistle (*Cirsium arvense)*, sweet clover (*Melilotus officinalis*), cocklebur (*Xanthium strumarium)*, and gumweed (*Grindelia squarrosa)*.

Wetlands provide watering points for wildlife and livestock and provide habitat diversity. Species include sedges (*Carex spp*.), rushes (*Juncus spp*.), bulrush (*Schoenoplectus spp.)*, cattail (*Typha spp.)*, wild rose (*Rosa spp.)*, and snowberry (*Symphoricarpos spp.)*. At higher elevations they are associated primarily with springs, seeps, and intermittent streams. Precipitation-dependent wetland sites fluctuate annually, in a range from dry to wet, in direct response to seasonal moisture, temperature, and wind.

From the Montana Natural Heritage Program (MTNHP) provisional mapping GIS data and the USFWS National Wetland Inventory (NWI) GIS data, 8 proposed lease parcels contain approximately 31 acres of delineated riparian or wetland areas (see Table 3). This list is not comprehensive because complete GIS data was not available for 1 of the lease parcels: MTM 105431-WW.

Table 3: MTNHP and USFWS Riparian and Wetland Areas by Lease Parcel[1,2]

Riparian/Wetland Type	Classification	Acres
Freshwater Emergent Wetland	Palustrine, Emergent, Temporary Flooded	6.8
	Palustrine, Emergent, Temporary Flooded, Diked/Impounded	<0.1

Riparian/Wetland Type	Classification	Acres
	Palustrine, Emergent, Seasonally Flooded	6.4
	Palustrine, Emergent, Seasonally Flooded, Diked/Impounded	0.8
	Palustrine, Emergent, Semipermanently Flooded, Diked/Impounded	0.5
Freshwater Pond	Palustrine, Aquatic Bed, Semipermanently Flooded	5.8
	Palustrine, Aquatic Bed, Semipermanently Flooded, Diked/Impounded	3.3
	Palustrine, Unconsolidated Shore, Temporary Flooded, Diked/Impounded	0.2
	Palustrine, Unconsolidated Shore, Seasonally Flooded	<0.1
	Palustrine, Unconsolidated Shore, Seasonally Flooded, Diked/Impounded	2.6
Riparian	Riparian, Lotic, Forested	4.8

[1](USFWS 2009) [2] This list is not comprehensive because complete GIS data was not available for lease parcels MTM 105431-WW.

Competition from invasive, non-native plants constitutes a potential threat to native plant species and wildlife habitat within the analysis area. Several invasive, non-native plant species are found in the analysis area including: crested wheatgrass (*Agropyron cristatum*), Japanese brome (*Bromus japonicas*), cheatgrass (*Bromus tectorum*), and foxtail barley (*Hordeum jubatum*). Crested wheatgrass occurs in areas as a result of being planted to increase forage production or to stabilize soils by reducing erosion. Cheatgrass, Japanese brome, and foxtail barley are all aggressive invasive species that out-compete desirable vegetation for water and soil nutrients.

Noxious weeds are invasive species and occur in scattered isolated populations throughout the analysis area. The most common species of noxious weeds are leafy spurge, Russian knapweed, spotted knapweed, field bindweed and Canada thistle. Noxious weed control is the responsibility of the land owner or land managing agency. Chemical and biological control methods are utilized, with chemical control being the more predominant.

3.6 Special Status Species

3.6.1 Special Status Plant Species

According to the MTNHP, there are no known threatened or endangered plant species located within the lease parcels. Ten plant species on the Montana Plant Species of Concern list have been identified as having suitable habitat in areas near these parcels (MTNHP, 2014). These species are listed in the Table 4 and have the potential to exist on the lease parcels. Three of these species are also identified as BLM “Sensitive” plants.

According to the MTNHP field guide, these plants are typically found in very specific habitats and do not occur predictably across the landscape. Following is a list of Montana’s species of concern that may have existing populations and/or suitable habitat on or near the lease parcels by county:

Table 4. MT Species of Concern and BLM Sensitive Plants in or near lease parcels

Plant Name	Common Name	County	Habitat Description
Carex gravida	Pregnant sedge	Richland	wetland/riparian
Dalea enneandra	Nine-anther prairie clover	Richland	grasslands (plains)
Dalea villosa	Silky prairie clover	Richland	sandy sites
Dalea enneandra	Nine-anther prairie clover	Richland	grasslands (plains)
Dalea villosa	Silky prairie clover	Richland	sandy sites
Lobelia spicata *	Pale-spiked Lobelia	Richland	Moist meadow
Solidago ptarmicoides	Prairie Goldenrod	Richland	Moist meadow
Suckleya suckleya*	Suckleya suckleana	Richland, Roosevelt	wetland/riparian
Viburnum lentago*	Nannyberry	Richland	Riparian forests
Teucrium canadense	American Germander	Roosevelt	Moist meadow
Carex crawei*	Crawe's Sedge	Prairie	wetland/riparian
Astragalus barrii*	Barr's Milkvetch	Powder River	Sparsely vegetated knobs and buttes
* BLM Sensitive			

3.6.2 Special Status Animal Species

Special status species (SSS), collectively, are USFWS Federally listed or proposed species, and the BLM sensitive species from the 2009 Montana/Dakota's sensitive species list. The BLM sensitive species also include both Federal candidate species and delisted species within 5 years of delisting.

3.6.2.1 Aquatic Wildlife

For aquatic wildlife in the analysis area there are 9 fish, 3 amphibians, and 2 aquatic reptile species that are special status or are sensitive species (Table 5). All of these species depend on perennial and intermittent streams or rivers with intact floodplains, wetlands, and riparian areas that have functional habitat. One fish species, the pallid sturgeon (*Scaphirhyncus albus*), was federally listed as endangered by the U.S. Fish and Wildlife Service in 1990. Threats to the pallid sturgeon are habitat modification, small population size, limited natural reproduction, hybridization, pollution and contaminants, and commercial harvest. The pallid sturgeon inhabits the large river systems of the analysis area. In the analysis area the Yellowstone River (from the MT/ND border upstream to near Forsyth, MT) and Missouri River (from the MT/ND border upstream to near Fort Benton) are considered pallid sturgeon habitat. Additionally, these large rivers are classified as having the highest concern for fish species (particularly ESA species and species of concern) habitat under the MFWP Crucial Area Planning System (CAPS 2010). The USFWS recently took further action by listing the shovelnose sturgeon (*Scaphirhynchus platorynchus*), which closely resembles the pallid sturgeon, as a threatened species where its range overlaps with the Pallid sturgeon (FWS 2010). In Table 6, endangered or sensitive aquatic wildlife species that occur within each of the lease parcels are listed.

Table 5. Aquatic sensitive or special status wildlife species in the analysis area.

Species	USFWS Status	BLM Sensitive	In Range	Suitable Habitat Present
Pallid Sturgeon	Endangered	Special Status	Yes	Yes
Blue Sucker	None	Sensitive	Yes	Yes
Northern Redbelly Dace *	None	None	Yes	Yes
Northern Redbelly X Finescale Dace	None	Sensitive	No	N/A
Paddlefish	None	Sensitive	Yes	Yes
Pearl Dace	None	Sensitive	Yes	Yes
Sauger	None	Sensitive	Yes	Yes
Iowa Darter *	None	None	Yes	Yes
Sicklefin Chub *	None	None	Yes	Yes
Sturgeon Chub	None	Sensitive	Yes	Yes
Snapping Turtle	None	Sensitive	Yes	Yes
Spiny Softshell	None	Sensitive	Yes	Yes
Plains Spadefoot	None	Sensitive	Yes	Yes
Great Plains Toad	None	Sensitive	Yes	Yes
Northern Leopard Frog	None	Sensitive	Yes	Yes

***Iowa darter, northern redbelly dace, and sicklefin chub are listed as species of concern by the Montana Fish, Wildlife, and Parks.**

Table 6. Endangered or sensitive aquatic wildlife species that occur in, or their ranges overlap with, the lease parcels.

Lease Parcel	Endangered or Sensitive Species
MTM 102757-WT	Blue sucker, Sauger, Northern leopard frog, Plains spadefoot, Great plains toad, Spiny softshell, Snapping turtle
MTM 102757-WW	Blue sucker, Sauger, Northern redbelly dace, Northern leopard frog, Plains spadefoot, Great plains toad
MTM 105431-HA	Pallid sturgeon, Paddle fish, Blue sucker, Sturgeon chub, Sicklefin chub, Sauger, Iowa darter, Northern redbelly dace, Pearl dace, Northern leopard frog, Plains spadefoot, Great plains toad
MTM 105431-HB	Pallid sturgeon, Paddle fish, Blue sucker, Sturgeon chub, Sicklefin chub, Sauger, Iowa darter, Northern redbelly dace, Pearl dace, Northern leopard frog, Plains spadefoot, Great plains toad
MTM 105431-H6	Pallid sturgeon, Paddle fish, Blue sucker, Sturgeon chub, Sicklefin chub, Sauger, Iowa darter, Northern redbelly dace, Pearl dace, Northern leopard frog, Plains spadefoot, Great plains toad
MTM 105431-H8	Pallid sturgeon, Paddle fish, Blue sucker, Sturgeon chub, Sicklefin chub, Sauger, Iowa darter, Northern redbelly dace, Pearl dace, Northern leopard frog, Plains spadefoot, Great plains toad
MTM 105431-H9	Sauger, Iowa darter, Northern redbelly dace, Pearl dace, Northern leopard frog, Plains spadefoot, Great plains toad
MTM 105431-JA	Sauger, Iowa darter, Northern redbelly dace, Pearl dace, Northern leopard frog, Plains spadefoot, Great plains toad

Lease Parcel	Endangered or Sensitive Species
MTM 105431-HC	Blue sucker, Sauger, Northern leopard frog, Plains spadefoot, Great plains toad, Spiny softshell, Snapping turtle
MTM105431-HD	Blue sucker, Sauger, Northern leopard frog, Plains spadefoot, Great plains toad, Spiny softshell, Snapping turtle
MTM 105431-HE	Blue sucker, Sauger, Northern leopard frog, Plains spadefoot, Great plains toad, Spiny softshell, Snapping turtle
MTM 105431-HG	Blue sucker, Sauger, Northern leopard frog, Plains spadefoot, Great plains toad, Spiny softshell, Snapping turtle
MTM 105431-HH	Blue sucker, Sauger, Northern leopard frog, Plains spadefoot, Great plains toad, Spiny softshell, Snapping turtle
MTM 105431-HJ	Blue sucker, Sauger, Northern leopard frog, Plains spadefoot, Great plains toad, Spiny softshell, Snapping turtle
MTM 105431-HF	Blue sucker, Sauger, Northern leopard frog, Plains spadefoot, Great plains toad, Spiny softshell, Snapping turtle
MTM 105431-HK	Blue sucker, Sauger, Northern leopard frog, Plains spadefoot, Great plains toad, Spiny softshell, Snapping turtle
MTM 105431-HL	Blue sucker, Sauger, Northern leopard frog, Plains spadefoot, Great plains toad, Spiny softshell, Snapping turtle
MTM 105431-HM	Blue sucker, Sauger, Northern leopard frog, Plains spadefoot, Great plains toad, Spiny softshell, Snapping turtle

Note: The sauger, northern leopard frog, plains spadefoot, and great plains toad may occur in all lease parcels.

3.6.2.2 Terrestrial Wildlife

Evaluating wildlife values at the landscape scale is key to understanding potential impacts of a project. Wildlife values, including terrestrial conservation species, species richness, game quality, and aquatic conservation connectivity, have been mapped at the landscape level for Montana by MFWP through their Crucial Areas Planning System (CAPS) 2010.

The lease parcels were reviewed in the CAPS GIS website as an overlay to potential aquatic, terrestrial, and habitat values. This course-scale landscape analysis of wildlife resources provides one tool for understanding the context of the wildlife values at a large scale. Fine-scaled tools, data, and resource information based on inventory and monitoring data, as well as local knowledge from BLM and MFWP employees, are used to further examine resource issues at the site-specific level for the specific resources contained in the lease parcels considered in this EA.

The analysis area covers a variety of habitat consistent with the Northern Great Plains. Lease parcels are located within short and mixed grass prairies, riparian habitats, cultivated lands, and others. See Section 3.5 for a detailed description of vegetation.

Some of these analysis areas provide habitat for species considered as BLM "special status species". Table ~~6~~ 7 presents the following: a list of species; whether the analysis area is within the current range of the species; and if so, whether suitable habitat is present within the lease parcels.

Table 7. Analysis area occurrence of BLM terrestrial sensitive species and USFWS threatened, endangered, candidate or proposed terrestrial species.

Species	USFWS Status	Special Status Species (SSS) and BLM Sensitive Species	In Current Range	Suitable Habitat Present
Mammals				
Gray Wolf*	None	Sensitive	No	Not applicable (N/A)
Grizzly Bear**	Threatened	Special Status Species (SSS)	No	N/A
Black-footed ferret	Endangered	SSS	No	No
Black-tailed prairie dog	None	Sensitive	Yes	No
Swift fox	None	Sensitive	Yes	Yes
Fisher	None	Sensitive	No	NA
Meadow Jumping Mouse	None	Sensitive	Yes	Yes
Great Basin Pocket Mouse	None	Sensitive	No	N/A
North American Wolverine	None	Sensitive	No	N/A
Pygmy rabbit	None	Sensitive	No	N/A
Long-legged Myotis	None	Sensitive	Yes	Yes
Long-eared Myotis	None	Sensitive	Yes	Yes
Fringed Myotis	None	Sensitive	No	N/A
Fringe-tailed Myotis	None	Sensitive	No	N/A
Pallid bat	None	Sensitive	No	N/A
Northern long-eared bat	Proposed Endangered	SSS	No	N/A
Townsend's big-eared bat	None	Sensitive	Yes	Yes
White-tailed prairie dog	None	Sensitive	No	N/A
Birds				

Species	USFWS Status	Special Status Species (SSS) and BLM Sensitive Species	In Current Range	Suitable Habitat Present
Common loon	None	Sensitive	Yes	Yes
Franklin's gull	None	Sensitive	Yes	Yes
Interior least tern	Endangered	SSS	Yes	No
Black tern	None	Sensitive	Yes	Yes
White-faced ibis	None	Sensitive	Yes	Yes
Whooping crane	Endangered	SSS	Yes	Yes
Yellow rail	None	Sensitive	Yes	Yes
Piping plover	Threatened, with critical habitat	SSS	Yes	No
Mountain plover	None	Sensitive	Yes	No
Marbled godwit	Bird of Conservation Concern (BCC)	Sensitive	Yes	Yes
Long-billed curlew	BCC	Sensitive	Yes	Yes
Black-crowned night heron	None	Sensitive	Yes	Yes
Bobolink	None	Sensitive	Yes	Yes
Greater sage-grouse	Candidate	Sensitive	Yes	Yes
Burrowing owl	BCC	Sensitive	Yes	No
Great gray owl	None	Sensitive	No	NA
Three-toed woodpecker	None	Sensitive	No	NA
Trumpeter swan	None	Sensitive	yes	unlikely
Flammulated owl	None	Sensitive	No	NA
Bald eagle	BCC	Sensitive	Yes	Yes
Golden eagle	None	Sensitive	Yes	Yes
Ferruginous hawk	None	Sensitive	Yes	Yes
Swainson's hawk	None	Sensitive	Yes	Yes
Peregrine falcon	None	Sensitive	Yes	unlikely
Northern goshawk	None	Sensitive	No	NA
Sage thrasher	BCC	Sensitive	Yes	Yes
Sprague's pipit	Candidate	Sensitive	Yes	Yes
Sedge wren	None	Sensitive	Yes	Yes
Loggerhead shrike	BCC	Sensitive	Yes	Yes
Chestnut-collared longspur	BCC	Sensitive	Yes	Yes
McCown's longspur	BCC	Sensitive	Yes	Yes
Baird's sparrow	BCC	Sensitive	Yes	Yes
Brewer's sparrow	BCC	Sensitive	Yes	Yes
LeConte's sparrow	None	Sensitive	Yes	Yes
Nelson's Sharp-tailed sparrow	None	Sensitive	Yes	Yes
Horned grebe	BCC	None	Yes	Yes
American bittern	BCC	None	Yes	Yes
Prairie falcon	BCC	None	Yes	Yes

Species	USFWS Status	Special Status Species (SSS) and BLM Sensitive Species	In Current Range	Suitable Habitat Present
Upland sandpiper	BCC	None	Yes	Yes
Yellow-billed Cuckoo	BCC	SSS	Yes	possible
Short-eared owl	BCC	None	Yes	Yes
Lewis's woodpecker	BCC	None	No	NA
Red-headed woodpecker	BCC	Sensitive	Yes	Yes
Black-backed woodpecker	None	Sensitive	No	NA
Sage sparrow	BCC	Sensitive	Yes	unlikely
Grasshopper sparrow	BCC	None	Yes	Yes
Dickcissel	BCC	Sensitive	Yes	Yes
Blue-gray natcatcher	None	Sensitive	No	N/A
Harlequin duck	None	Sensitive	No	N/A
Amphibians				
Great Plains toad	None	Sensitive	Yes	Yes
Northern leopard frog	None	Sensitive	Yes	Yes
Plains spadefoot toad	None	Sensitive	Yes	Yes
Boreal/Western Toad	None	Sensitive	No	N/A
Coeur d'Alene salamander	None	Sensitive	No	N/A
Reptiles				
Snapping turtle	None	Sensitive	Yes	Yes
Spiny softshell	None	Sensitive	Yes	Yes
Greater short-horned lizard	None	Sensitive	Yes	Yes
Milk snake	None	Sensitive	Yes	Yes
Western hog-nosed snake	None	Sensitive	Yes	Yes

Table ~~6~~7 sources: Montana Bird Distribution Committee 2012; Werner, Maxell, Hendricks, and Flath. 2004; Foresman 2001; MTNHP, 2010; BLM, 2009; USDA – NRCS Plants Database, 2010
*Gray wolf has been delisted so has been moved to the sensitive list
**Grizzly bear has been delisted for the Greater Yellowstone ecosystem. In that area it is a Bureau sensitive species.

3.6.2.3 Threatened, Endangered, Candidate, and Proposed Species

Threatened, endangered, or candidate wildlife species may occupy habitat infrequently or seasonally within the analysis area. These species include the whooping crane, sage grouse, and Sprague's pipit.

The USFWS has identified a primary migration corridor for the Aransas-Wood Buffalo population of whooping cranes (http://ecos.fws.gov/docs/recovery_plan/070604_v4.pdf). Lease parcels H6, H8, H9, and JA are located within this primary migration corridor. Nesting by whooping cranes has not been documented in the analysis area; however, stopover observations have been documented in eastern MT.

Two species recently classified as USFWS candidate species occur within the analysis area. These are the Sprague's pipit and the greater sage grouse. Candidate species are those that warrant protection under the Endangered Species Act, but listing the candidate species is precluded by the need to address other listing actions of a higher priority. The USFWS will review the need for listing these species annually and will propose the species for protection when funding and workload for other listing actions allow.

On March 5, 2010, USFWS concluded sage grouse warrants protection under the Endangered Species Act. However, USFWS determined the listing of the species is precluded by the need to take action on higher priority species. Sage grouse was placed on the list of species that are candidates under the Endangered Species Act.

Sage grouse are a native prairie grouse species that are considered sagebrush obligates and depend on sagebrush for survival. Lease parcel WW is located within 0.25 miles of a sage grouse lek location. In addition, 3 other lease parcels are located within 2 miles of lek locations. These include parcels WT, HG, and HF. Instruction Memorandum (IM) No. 2012-043 (BLM, 2011) identified Preliminary Priority Habitat (PPH), and Preliminary General Habitat (PGH) polygons for sage grouse in the planning area. In addition, IM No. 2012-043 provides conservation policies and procedures for sage grouse management within these polygons. None of the parcels are proposed within the PPH polygon; however, parcels HD, HE, HG, HH, HJ, HF, HK, HL, and HM are located within the PGH polygon.

Sprague's pipit was recently classified as USFWS candidate species and occurs within the analysis area. Candidate species are those that warrant protection under the Endangered Species Act, but listing the candidate species is precluded by the need to address other listing actions of a higher priority. The USFWS will review the need for listing these species annually and will propose the species for protection when funding and workload for other listing actions allow. Sprague's pipits were found warranted, but precluded as a threatened or endangered species on September 15, 2010. Sprague's pipits are strongly tied to native prairie (land which has never been plowed) throughout their life cycle (Owens and Myres 1973, pp. 705, 708; Davis 2004, pp. 1138-1139; Dechant et al. 1998, pp. 1-2; Dieni et al. 2003, p. 31; McMaster et al. 2005, p. 219). They are rarely observed in cropland (Koper et al. 2009, p. 1987; Owens and Myres 1973, pp. 697, 707; Igl et al. 2008, pp. 280, 284) or land in the Conservation Reserve Program (a program whereby marginal farmland is planted primarily with grasses) (Higgins et al. 2002, pp. 46-47). Sprague's pipits will use nonnative planted grassland (Higgins et al. 2002, pp. 46-47; Dechant et al. 1998, p. 3; Dohms 2009, pp. 77-78, 88). Vegetation structure may be a better predictor of occurrence than vegetation composition (Davis 2004, pp. 1135, 1137). (Federal Register: September 15, 2010 (Volume 75, Number 178)) Montana Natural Heritage Tracker has documented observations of Sprague's pipits in Daniels, Sheridan, Roosevelt, McCone, Richland, Dawson, Prairie, Custer, and Fallon Counties within the Miles City Field Office. Therefore, the proposed lease parcels have been identified as providing potential suitable habitat for Sprague's pipits based on a Sprague's pipit suitable habitat model utilized by the Montana Department of Fish, Wildlife, and Parks (http://apps.fwp.mt.gov/gis/maps/caps/), and aerial photography (NAIP, 2011). Ground-truthing of the parcels has not occurred to document actual habitat use by Sprague pipits, or that suitable habitat exists within all of the parcels identified by the model. However, it is likely that at least portions of these parcels provide suitable habitat for Sprague's pipits. These include parcels H8, H6, H9, JA, HB, HA, WW, and WT.

3.6.2.4 Other Sensitive Species

As noted in Table ~~6~~ 7 above, up to 51 wildlife species considered as BLM "sensitive" have the potential to occur within the analysis area. These include 37 birds, 6 mammals, 3 amphibians, and 5 reptiles. This list is a combination of recent and historic observations. In some instances, historic observations are the only known record. If a species is noted as in range, it signifies that habitat within the field office would be considered within the documented range of occupation of habitat by a particular species during some phase of its life cycle. This might be only for a short time frame, during migrations, seasonally, or possibly year-round. Documentation of occupation of habitat by specific wildlife species is considered good across this area for some species, (e.g., sage grouse) and lacking for other species (small mammals, herptiles, raptors, etc.). However, the table documents the potential for wildlife species occurrence if at least one lease parcel is located within a particular sensitive species' known range of habitat occupation based on available science and research.

Various bird surveys throughout different years have been conducted across the MCFO, which may have included some of the lease parcel areas or at least similar habitats. Surveys have been conducted by the United States Geological Survey, University of Montana Avian Science Center, Rocky Mountain Bird Observatory, MTNHP, and other interested "birders."   Migratory bird species diversity varies across the MCFO area. According to P.D. Skaar's Montana Bird Distribution, 6th edition (Lenard et al., 2003) species diversity ranges from less than 40 species per "latilong" (~3,200 square miles) to more than 200 across the analysis area.

The analysis area provides potential nesting, foraging, and migratory habitat for various species of raptors; however, recent surveys for raptor nests have not occurred. Two lease parcels, WT and HG, are located within 0.5 miles of one historic Ferruginous hawknest. In addition, parcel WW is located within 0.5 miles of a Swainson's hawk nest.   Other species that would be expected within the analysis area include red-tailed hawks, great-horned owls, northern harriers, bald and golden eagles, sharp-shinned hawks, and coopers hawks. . Peregrine falcons are also known to migrate through eastern Montana.

3.7 Fish and Wildlife

3.7.1 Aquatic Wildlife

The aquatic resources in the analysis area include aquatic wildlife and habitat for fish, aquatic arthropods (insects and crustaceans), amphibians, reptiles, and bivalves. The habitat consists of rivers, streams, and reservoirs that provide habitat for a variety of aquatic wildlife and riparian communities (and their varying lifecycle stages).

Based on known fish presence (MFWP 2010), there are approximately 20 miles of fish-bearing streams within the analysis area, but due to ongoing inventory efforts, the discovery of more prairie streams that support native fish and other aquatic wildlife would occur. Additionally, prairie fish are constantly moving through a landscape that balances, at the local and landscape scale, between drying and flooding stages. Consequently, the ability to migrate during high flows is a crucial life history strategy.

Aquatic resource conditions of streams are strongly related to riparian vegetation, upland range conditions, land use impacts, and quality and quantity of in-stream water. Habitat conditions throughout the analysis area vary between and within water bodies; the upper and middle reaches of smaller streams may be intermittent, while the lower reaches may receive perennial flows, resulting in different habitat conditions and different aquatic communities within the same stream. Prairie fish are adapted to these cycles of drying and flooding and thrive in these intermittent pools, provided land-use impacts are not severe (Bramblett et al. 2005). However, prairie streams are highly sensitive to disturbance, and due to this factor many prairie stream ecosystems are already imperiled due to anthropogenic activities (Dodds et al. 2004).

Riparian vegetation is a critical component in maintaining aquatic wildlife habitat and is a source of organic nutrients and food items for the prairie stream ecosystem, provides in-stream habitat for fish, amphibians, reptiles, and invertebrates, adds structure to the banks, and reduces erosion; when riparian vegetation senesces and falls into the stream, it adds cover, habitat complexity, and moderates water temperatures. In some cases throughout the analysis area, riparian habitats have been degraded, and the results include increases in erosion and sedimentation, shallower and wider streams (which increases evaporation and thus decreases water quality and quantity), increases in temperature fluctuations, and critically low oxygen content levels; these effects collectively reduce or degrade available aquatic wildlife habitat.

Existing factors limiting or affecting aquatic resources in the analysis area include the lack of a normative flow regime primarily through extensive reservoir development; loss or degradation of riparian habitat; habitat fragmentation; livestock grazing damage; past and current oil and gas development; un-passable fish & aquatic wildlife culverts, oil skimmers, and other stream crossings; and excess siltation due to the various land use activities.

3.7.2 General Wildlife

A diversity of topography and vegetation types exists across the analysis area. This diversity provides habitat for many wildlife species in addition to those previously mentioned.

Current and historic land uses within or adjacent to the lease parcels include grazing, farming, hunting, energy development, and others. A few areas contain blocks of well-functioning habitats, while other areas are composed of small, fragmented patches of native habitat and cultivated lands. In some areas, existing anthropogenic disturbance at some frequency can be expected to reduce habitat suitability for some species of wildlife intolerant to human activities.

The analysis area supports a variety of game and nongame species. Limited wildlife species and habitat surveys have been conducted within a portion of the analysis area. Although the entire area has not been comprehensively surveyed for all wildlife resources, past surveys document what species occur, and provides insight into what other species can be expected to occur within existing habitat types.

Mule deer are the most abundant big game species and use the greatest variety of habitats, generally preferring sagebrush, grassland, and conifer types (BLM 1984). Habitat diversity appears to be a good indicator of intensity of deer use. In mule deer habitats, diversity of vegetation usually followed topographic diversity; thus, rugged topography may be the ultimate factor influencing mule deer use of an area (Mackie et. Al. 1998). Habitat such as riparian bottoms, agricultural areas, and forests are used as well, both yearlong or seasonally. Habitat to support mule deer exists within all of the lease parcels.

Winter range is often part of year-round habitat in eastern Montana. Winter ranges are typically in areas of rougher topography and are often dominated by shrub species that provide crucial browse during winter months. Rough topography also provides critical escape and thermal cover important for maintenance and survival. Although there is little or no seasonal migration for big game species within the planning area, there are winter habitats crucial for big game survival during periods of harsh winters. This crucial winter habitat (i.e. crucial winter range) is typically located on relatively large landscapes supporting a diversity of slopes, aspects, and topographic features. Crucial winter range is often part of year-round habitat and is typically dominated by important shrub species, such as rubber rabbitbrush, skunkbush sumac, and saltbush. Breaks, badlands, and brushy draws are examples of preferred winter range in open prairie country. Additional habitat types of importance as crucial mule deer winter range, also includes hardwood and pine forests. These habitat types provide escape and thermal cover, which are also important for maintenance and survival.

The importance of the crucial winter range to the survival of the big game species is illustrated by the percentage of the mule deer population occupying the area during harsh winters. MFWP observed that 73 percent of the mule deer seen in winter concentration areas in southeastern Montana were in rough topography, particularly in pine-dominated habitats (Youmans and Swenson 1982). While along the Powder and Little Missouri rivers, riparian habitat accounted for 94 percent of the wintering mule deer concentrations. Of the 18 proposed lease parcels, 6 of those are located within crucial mule deer winter range. These include parcels H8, H6, HB, HK, HL, and HM.

White-tailed deer are common in the analysis area. White-tailed deer prefer riparian drainage bottoms, hardwood draws, and conifer areas, but they will also use a variety of other habitats including farmlands. During the winter, white-tailed deer using forested areas prefer dense canopy classes, moist habitat types, uncut areas, and low snow depths. Suitable winter range is a key habitat factor for white-tailed deer, and winter concentration areas occur almost exclusively in riparian and wetland habitats and dense pine (Youmans and Swenson 1982). Although white-tailed deer move on and off winter range, as dictated by seasonal habitat requirements, the animals do not migrate for long distances (Hamlin 1978). One parcel, HM, is proposed for lease within delineated crucial white-tailed deer winter range.

Pronghorn antelope are widely distributed across the analysis area. They are generally associated with grasslands and shrublands, but they also seasonally use agricultural fields. Winter ranges for pronghorn antelope generally occur within sagebrush grasslands with at least greater densities of big sagebrush than the surrounding areas. Crucial winter ranges for pronghorn exists within parcels WW, WT, HC, HD, HE, HG, HH, HJ, and HF. The potential exists for other big game species to occupy the areas. Species include elk, moose, mountain lion, and black bear although presence would likely occur as individual’s transition to preferred habitats elsewhere.

The potential for big game movements or migrations through eastern Montana are not fully understood. At a local level, it is reasonable to assume big game movements occur at least seasonally. Migration corridors have not been identified through any of the lease parcels.

Sharp-tailed grouse are the other native prairie grouse species in the analysis area. Sharp-tailed grouse generally prefer hardwood draws, riparian areas, and prairie grasslands intermixed with shrubs such as chokecherry and buffaloberry. Lease parcels H8 and WW are located within 0.25 miles of sharp-tailed grouse dancing grounds. In addition, portions or all of 10 lease parcels are located within 2 miles of sharp-tailed grouse leks, and most of these parcels would be expected to provide at least seasonal habitat for sharp-tailed grouse. These parcels include H8, H6, WW, WT, HC, HD, HE, HK, HL, and HM.

Wild turkeys, pheasants, and Hungarian partridge are all species that have been introduced to eastern Montana and would be expected to utilize available habitats within some of the parcels.

3.8 Cultural Resources

The BLM is responsible for identifying, protecting, managing, and enhancing cultural resources located on public lands or those that may be affected by BLM management actions on non-Federal lands. Cultural resources include archaeological, historic, architectural properties, and traditional lifeway values important to Native Americans. Sites can vary with regard to their intrinsic value as well as their significance to scientific study; therefore, management practices employed are commensurate with their designation. Significant cultural resource values include; their use to gather scientific information on human culture, history, interpretive and educational value, values associated with important people and events of significance in history, and often aesthetic value, as in a prehistoric rock art panel or an historic landscape.

A generalized prehistory of eastern Montana can be categorized in a chronological framework, and time periods are distinguished on the basis of differences in material culture traits or artifacts and subsistence patterns: the PaleoIndian period (ca. 12,500 BP-7800 BP), Archaic period (ca. 7800 BP-1500 BP), Prehistoric period (ca. 1500 BP-200 BP), Protohistoric period (ca. 250 BP-100 BP), and Historic Periods (A.D. 1805-A.D. 1960) (Aaberg et al 2006).

Cultural sites are evaluated with reference to their eligibility for listing on the National Register of Historic Places (NRHP). Each site is considered on a case-by-case basis.

A recent Class I overview of cultural resources was prepared for the analysis area (Aaberg et al 2006). The cultural environment of the MCFO as of May 2005 contained 7,065 prehistoric and 2,869 historic archeological sites as well as 1,929 paleontological localities. Archeological properties (historic and prehistoric sites) occur in all counties encompassed by the field office. The five counties with nominated lease parcels contain 33.8 percent of all prehistoric and 29.9 percent of all historic resources within the MCFO. Each of the five counties contains the following percentages of resource site types within its boundaries: McCone 2.3 percent prehistoric, 4.2 percent historic, Powder River 23.2 percent prehistoric, 8.1 percent historic, Prairie 2.6 percent prehistoric, 5.2 percent historic, Richland 1.9 percent prehistoric, 6.1 percent historic and Roosevelt 3.7 percent prehistoric, 6.2 percent historic.

The overall archeological site density of the MCFO (historic and prehistoric) is estimated at one site per 93 acres (Aaberg et al 2006). Prehistoric sites are estimated to be distributed at one site per 130.8 acres (4.9 per square mile) and historic sites at one site per 322 acres (two per square mile) for all surveyed acres within the MCFO. Approximately 10% to 15% of all sites are found to be or have the potential to be eligible for listing in the National Register of Historic Places.

A review of the Montana State Historical Preservation Office (SHPO) Cultural Resource Information System (CRIS) and Cultural Resource Annotated Bibliography System (CRABS), as well as BLM Cultural Resource databases and GIS data, indicates one (1) lease parcel (MTM 105431-H9) contains recorded cultural sites within the lease parcel boundaries. Inventory data is not available for a majority of individual lease parcels; however some parcels have incomplete coverage of cultural resource inventory.

The one parcel with identified sites contains three sites, all of the same site type within the boundaries of the reviewed parcel. Each site is a stone circle site. None of the sites have been evaluated for eligibility for inclusion in the National Register of Historic Places and may be of interest to Native American concerns, See Section 3.9.

3.9 Native American Religious Concerns

The BLM's management of Native American Religious concerns is guided through its 8120 Manual: *Tribal Consultation Under Cultural Resources Authorities* and 8120 Handbook: *Guidelines for Conducting Tribal Consultation*. Further guidance for consideration of fluid minerals leasing is contained in BLM Washington Office Instruction Memorandum 2005-003: Cultural Resources, Tribal Consultation, and Fluid Mineral Leasing. The 2005 memo notes leasing is considered an undertaking as defined in the National Historic Preservation Act. Generally areas of concern to Native Americans are referred to as "Traditional Cultural Properties" (TCPs) which are defined as cultural properties eligible for the National Register of Historic Places because of its association with cultural practices or beliefs that (a) are rooted in that community's history and (b) are important in maintaining the continuing cultural identity of the community.

Areas of tribal concern in southeast Montana are listed in Appendices B-E of the Ethnographic Overview of Southeast Montana (Peterson and Deaver 2002). Based on input from various tribes, the 2002 Ethnographic Overview also identified 12 sensitive site types. These include battlefield and raiding sites, burials, cairns, communal kills, fasting beds (vision quests), homesteads, medicine lodges, rock art, settlements (campsites), stone rings, spirit homes, and environmental places (plant gathering areas, mineral and fossil collection areas).

The Crow Tribe's 2002 document noted rock art, fasting sites, siege sites, camp sites, mourning sites, final resting places (burials), buffalo jumps, and environmental areas, including animal habitats and natural areas of concern such as springs. The Northern Cheyenne Tribe in its 2002 document noted large ring sites (both in terms of ring diameters and ring numbers), isolated fasting beds, rock art sites, and large diameter fasting structure as having religious significance to the tribe.

One parcel (MTM 105431-H9) contains three stone circle sites (24RV141-24RV143). The sites are currently unevaluated for listing on the National Register of Historic Places. A review of 2009 aerial imagery shows the well was not drilled and the sites have not been impacted by fluid mineral development. Prior to surface any surface disturbance the sites require a reevaluation of National Register eligibility including tribal participation.

3.10 Paleontology

According to Section 6301 of the Paleontological Resource Protection Act of 2009 Omnibus Public Lands Bill, Subtitle D, SEC. 6301, paleontological resources are defined as "any fossilized remains, traces, or imprints of organisms, preserved in or on the earth's crust, that are of paleontological interest and that provide information about the history of life on earth" (Paleontological Resource Protection Act of 2009 Omnibus Lands Bill, Subtitle D, SEC. 6301-3612 (P.L. 59-209; 34 Stat. 225; 16 U.S.C. 431-433). All vertebrate fossils, be they fossilized remains, traces, or imprints of vertebrate organisms, are considered significant. Paleontological resources do not include archaeological and cultural resources.

The BLM utilizes the Potential Fossil Yield Classification (PFYC) as a planning tool for identifying areas with high potential to yield significant fossils. The system consists of numbers ranging from 1-5 (low to high) assigned to geological units, with 1 being low potential and 5

being high potential to have significant fossil resources. It should be pointed out that the potential to yield significant fossil resources is never 0. Rock units not typically fossiliferous can in fact contain fossils in unique circumstances.

The BLM classified geologic formations that have a high Potential Fossil Yield Classification (PFYC) of 3 or higher should be specifically reviewed for paleontological resources. The MCFO has the following classifications on the relevant geologic units:

Quaternary deposits	Class 2 and 3
Ft Union	Class 4
Hell Creek	Class 5

All or part of the 18 parcels include geologic units rated as PFYC 3-5 and should be evaluated for fossil resources before and potentially during ground-disturbing activities.

3.11 Visual Resources

BLM Visual Resource classifications are only applied to BLM surface acres, as such the affected environment for visual resources only consists of approximately 3,640 acres of BLM – administered surface in the analysis area (Table 7).

A Class II VRM area classification means that the character of the landscape has unique combinations of visual features such as land, vegetation, and water. The existing character of the landscape should be retained. Activities or modifications of the environment should not be evident or attract the attention of the casual observer. Changes caused by management activities must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

A Class III VRM area classification means the level of change to the character of the landscape should be moderate. Changes caused by management activities should not dominate the view of the casual observer and should not detract from the existing landscape features. Any changes made should repeat the basic elements found in the natural landscape such as form, line, color and texture.

A Class IV VRM area classification means that the characteristic landscape can provide for major modification of the landscape. The level of change in the basic landscape elements can be high. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Table 8: VRM Classes for the analysis area by lease parcel

Leasing Areas	VRM Class II Acres	VRM Class III Acres	VRM Class IV Acres
RICHLAND COUNTY	***0 total acres***	***722 total acres***	***37 total acres***
MTM 105431-HB	0	600	0
MTM 105431-H6	0	122	0
MTM 105431-H8	0	0	37
PRAIRIE COUNTY	***0 total acres***	***961 total acres***	***958 total acres***
MTM 102757-WT	0	961	0
MTM 102757-WW	0	0	958
POWDER RIVER COUNTY	***0 total acres***	***0 total acres***	***960 total acres***
MTM 105431-HD	0	0	80
MTM 105431-HE	0	0	160
MTM 105431-HK	0	0	640
MTM 105431-HL	0	0	80

3.12 Forest and Woodland Resources

Evergreen forest habitat types occurring in the analysis area include ponderosa pine (*Pinus ponderosa*) and Rocky Mountain juniper (*Juniperus scopulorum*). Deciduous forest habitat types include Green ash (*Fraxinus pennsylvanica*)/Chokecherry (*Prunus virginiana)*, and Great Plans Cottonwood (*Populus deltoids)/*Herbaceous Communities. The deciduous habitat types occur along streams, rivers, lakes springs, and ponds, occupying terraces, fans, and floodplain positions. The Green ash/Choke cherry habitat types occur in V-shaped ravines (also called woody draws), where sites may occasionally be flooded by storm runoff flows. Table 9, summarizes forest and woodland acres in the analysis area by forest type and individual parcel.

Table 9. Forestland Acreage and Forest Type by Lease Parcel

Lease Parcel	Evergreen Forest	Deciduous Forest	Mixed Forest	Total Acres
MTM 102757-WT				
MTM 102757-WW				
MTM 105431-H6		123		123
MTM 105431-H8				
MTM 105431-H9				
MTM 105431-HA				
MTM 105431-HB	66			66
MTM 105431-HC	1006	235	7	1248
MTM 105431-HD	591		57	648

MTM 105431-HE				
MTM 105431-HF			4	4
MTM 105431-HG				
MTM 105431-HH			5	5
MTM 105431-HJ		3	7	10
MTM 105431-HK				
MTM 105431-HL			4	4
MTM 105431-HM	8			8
MTM 105431-JA				
Total	**1671**	**361**	**84**	**2116**

Source: GAP Vegetation Cover Types

The deciduous forest habitats add to the overall diversity of the landscape. They also attract wildlife and livestock for thermal cover, nesting habitat, moisture, browse and, and hiding cover. Because of this, these woodlands are focal points for some of the livestock and wildlife management. The evergreen forests occur in a mosaic patters across the grasslands. These evergreen habitats commonly occur on moderate to steep slopes. Ponderosa pine species tolerates dry environments more successfully than other native confer except Rocky Mountain juniper. Rocky Mountain juniper has an interesting ecological role in the northern Great Plans. In some cases, it can be the dominant species present in the stand or can be the understory of Ponderosa pine stands and some deciduous stands.

3.13 Livestock Grazing

Nine of the parcels (MTM 105431-H8, MTM 105431-H6, MTM 105431-HB, MTM 105431-HD MTM 105431-HE, MTM 105431-HK, MTM 105431-HL, MTM 102757-WW, and MTM 102757-WT) in whole or part have BLM surface ownership within currently permitted grazing allotments. These parcels occur in Richland, Prairie and Powder River counties and include portions of ten separate grazing allotments. Cattle are the only class of livestock authorized to graze these allotments. Of the ten allotments, seven of the grazing authorizations do not restrict the grazing season or number of livestock due to the small percentage of public land within the allotment. Three allotments are authorized under active use which has strict seasons and numbers and are typically made up of a higher percentage of public land. None of the allotments are under an Allotment Management Plan (AMP). These allotments contain range improvements such as fences and reservoirs that have access roads for livestock management purposes. The remainder of the lease parcels does not contain any BLM administered lands and are primarily lands with private surface ownership.

3.14 Recreation and Travel Management

The BLM only manages recreational opportunities and experiences on BLM-administered surface. The affected environment consists of approximately 3,640 acres of BLM-administered surface. Recreational activities enjoyed by the public on BLM lands within the analysis area include hunting, hiking, camping, fishing, photography, picnicking, and winter activities such as snowshoeing and snowmobiling. Benefits and experiences enjoyed by recreational users include opportunities for solitude, spending time with families, enhancing leisure time, improving sports skills, enjoying nature and enjoying physical exercise.

Out of the approximately 3,640 BLM-administered acres proposed for lease, less than 950 acres have legal public access. The types of public use on the 950 acres lease parcels can be characterized as casual dispersed recreational activities including hiking, hunting (including outfitters), camping, and wildlife viewing. The rest of the BLM- administered acres have no public easements or rights-of-way across private property for legal land access. The lack of public access limits use of the BLM parcels for recreational use by the general public.

3.15 Lands and Realty

The analysis area consists of 18 parcels that include 7,945.28 surveyed surface acres of which 3,637.97 surveyed acres are BLM administered surface and 4,307.31 surveyed acres are Non-Federal surface (private). Table 10 below categorizes the 18 parcels by surface ownership and county.

There are three lease parcels with authorized BLM Rights-of Way (ROWs) approved on BLM administered surface, MTM-102757-WT, MTM-105431-HB and MTM-105431-H8.

Table 10. Number of parcels, surface ownership, and acres by county.

County	Parcels	Owner-ship	Acres
MCCONE			
	1 parcel (MTM-105431-HA)	Non-Federal	40
	1 TOTAL		**40**
RICHLAND			
	3 partial parcels (MTM-105431-HB, MTM-105431-H6, MTM-105431-H8)	BLM	758.73
	3 partial parcels (MTM-105431-HB, MTM-105431-H6, MTM-105431-H8)	Non-Federal	430.48
	3 TOTAL		**1189.21**
ROOSEVELT			
	1 parcel (MTM-105431-H9)	Non-Federal	160.02
	1 parcel (MTM-105431-JA)	Non-Federal	39.94
	2 TOTAL		**199.96**
PRAIRIE			
	1 parcel (MTM-102757-WT)	BLM	961.22
	1 parcel (MTM-102757-WW)	BLM	958.02
	2 TOTAL		**1,919.24**
POWDER RIVER			
	1 parcel (MTM-105431-HC)	Non-Federal	640
	1 partial parcel (MTM-105431-HD)	Non-Federal	560
	1 partial parcel (MTM-105431-HD)	BLM	80
	1 parcel (MTM-105431-HE)	BLM	160
	1 parcel (MTM-105431-HG)	Non-Federal	160

County	Parcels	Owner-ship	Acres
MCCONE			
	1 parcel (MTM-105431-HH)	Non-Federal	440
	1 parcel (MTM-105431-HJ)	Non-Federal	316.87
	1 parcel (MTM-105431-HF)	Non-Federal	640
	1 parcel (MTM-105431-HK)	BLM	640
	1 parcel (MTM-105431-HL)	Non-Federal	640
	1 parcel (MTM-105431-HM)	Non-Federal	320
	10 TOTAL		**4,596.87**

***parcels MTM-105431-HB, H6, H8 and HD contain both Federal and Non-Federal surface.**

3.16 Minerals

3.16.1 Fluid Minerals

It is the policy of the BLM to make mineral resources available for development and to encourage development of these resources to meet national, regional, and local needs, consistent with national objectives of an adequate supply of minerals at reasonable prices. At the same time, the BLM strives to assure that mineral development occurs in a manner which minimizes environmental damage and provides for the reclamation of the lands affected.

Currently there are 1,560 Federal oil and gas leases covering approximately 955,572.612 acres in the MCFO. The number of acres leased and the number of leases can vary on daily basis as leases are relinquished, expired, or are terminated. Existing production activity occurs on approximately 20.4 (195,497.180 acres) percent of this lease acreage. Information on numbers and status of wells on these leases and well status and numbers of private and State wells within the external boundary of the field office is displayed in Table 11. Numbers of townships, lease acres within those townships, and development activity for all jurisdictions are summarized in Table 12.

Exploration and development activities would only occur after a lease is issued and the appropriate permit is approved. Exploration and development proposals would require completion of a separate environmental document to analyze specific proposals and site-specific resource concerns before BLM approved the appropriate permit.

Table 11. Existing Development Activity

	FEDERAL WELLS	PRIVATE AND STATE WELLS
Drilling Well(s)	9	125
Producing Gas Well(s)(including CBNG)	453	470
Producing Oil Well(s)	418	1890
Water Injection Well(s)	154	357
Shut-in Well(s)	154	1430

Temporarily Abandoned Well(s)	87	219

Table 12. Oil and Gas Leasing and Existing Development within Townships Containing Parcels

	Richland	Roosevelt	McCone
Number of Townships Containing Lease Parcels	6	7	2
Total Acres Within Applicable Township(s)	119,455	52,610	23,072
Acres of Federal Oil and Gas Minerals	28,834	309	2778
Percent of Township(s)	24.1%	0.6%	12.0%
Acres of Leased Federal Oil and Gas Minerals	24,076	141	2,698
Percent of Township(s)	20.2%	0.3%	11.7
Acres of Leased Federal Oil and Gas Minerals Suspended	Zero	Zero	Zero
Percent of Township(s)	0.0%	0.0%	0.0%
Federal Wells	7 producing oil wells (6 are horizontal wells), 3 shut in wells, 1 P&A wells, 5 temporarily abandoned wells.	1 P&A well	Zero
Private and State Wells	36 producing oil wells (35 are horizontal), 16 P&A wells, 1 service wells, 6 temporarily abandoned wells.	29 producing oil wells (24 are horizontal wells), 35 P&A wells, 4 service wells, 2 shut in wells, 8 temporarily abandoned wells.	1 P&A well.

	Prairie	Powder River
Number of Townships Containing Lease Parcels	4	4
Total Acres Within Applicable Township(s)	61,180	91,845
Acres of Federal Oil and Gas Minerals	26,576	50,833
Percent of Township(s)	43.4	55.3
Acres of Leased Federal Oil and Gas Minerals	Zero	24,981
Percent of Township(s)	0.0%	27.2
Acres of Leased Federal Oil and Gas Minerals Suspended	Zero	Zero
Percent of Township(s)	0.0%	0.0%
Federal Wells	Zero	2 Producing oil wells, 58 P&A wells.
Private and State Wells	3 P&A wells.	34 P&A wells, 2 service wells.

3.17 Special Designations

3.17.1 Lewis and Clark National Historic Trail

Two Lease parcels, MTM 105431-H8 and HB (947.3 acres), are located within a 3 mile sensitive Setting Consideration Zone (SCZ) around the Lewis and Clark National Historic Trail (NHT) and SRMA. The Lewis and Clark NHT is managed in accordance with the National Trail System Act of 1968, as amended (16 USC 1241-1251) to identify and protect the historic route and its historic remnants and artifacts for public use and enjoyment. The trail would be managed to preserve the historic and cultural resources that are related to the events that occurred during the Lewis and Clark Expedition. The National Park Service (NPS), who is the lead agency for trail administration, established the overall management vision through their Comprehensive Management Plan (1982) and Foundation Document (2012). BLM works collaboratively with NPS to manage trail resources in conformance with these plans and guidance thought BLM Manual 6280.

Any changes in the landscape within view of the Lewis and Clark NHT will be guided by Class II visual resource management objectives and the Lewis and Clark SRMA.

3.18 Social and Economic Conditions

3.18.1 Social and Environmental Justice

The social section focuses on the areas in the immediate vicinity of the parcels proposed for leasing. This area includes seven counties in eastern Montana: Daniels, Garfield. McCone, Prairie, Richland, Roosevelt, and Rosebud 80% of acres examined for leasing located in Prairie County. In 2010 this seven county region was reported to have a population of 35,274 people, with more than 80% of the region's population living within Richland (10,425), Roosevelt

(9,746), and Rosebud (9,233) Counties. Smaller Populations were reported in Daniels (1,751), Garfield (1,206), McCone (1,734), and Prairie (1,179) Counties (U.S. Census, 2010). Census data indicated that populations within this region declined between 2000 and 2010. Although all seven counties reported population losses during this time period, losses in Daniels (13.2%), Garfield (5.7%) and McCone (12.3%) counties were substantially greater than those in Prairie (1.7%), Richland (0.8%), Roosevelt (1.8%), and Rosebud (1.6%) (US Department of Commerce, 2012). While Montana is often characterized as a rural state with a population density of 6.8 persons per square mile, all of the seven counties with land proposed for oil and gas leasing were reported to have fewer than 6.8 persons per square mile in 2010. Of these seven counties, only Daniels (1.2), Richland (4.7), Roosevelt (4.4), and Rosebud (1.8) had population densities greater than 1. The county seats for these counties include Scobey in Daniels County (1,107), Jordan in Garfield County (352), Circle in McCone County (526), Terry in Prairie County (605), Sidney in Richland County (4,843), Wolf Point in Roosevelt County (2,621), and Forsyth in Rosebud County (1,777) (U.S. Census, 2010).

Currently oil and gas leasing and production are taking place on public and private lands within these seven counties. Approximately half of the acres being considered for this lease sale are under BLM ownership, with an addition 2,876 acres under split ownership between BLM and private estates. Interest in oil and gas development in this region has significantly increased over the last five years because of its proximity to the Bakken formation which extends from the Williston Basin in western North Dakota to northeastern Montana. Richland, MT, which is adjacent to the Williston Basin, has had the highest oil and gas production on federal lands of any of county in eastern Montana. Most of the oil and gas industry support services for eastern Montana occur in Glendive, Sidney, and Miles City, Montana, and Williston and Dickinson, North Dakota.

According to the 2010 Census populations in the seven counties with land proposed for oil and gas leasing were made up of individuals who identified with one of three racial groups: White alone, American Indian alone, or of Two or more races. While 70% of the total population in this seven-county region identified themselves as White alone, individuals identifying themselves at White accounted for more than 95% of the total population in five of the seven counties (Daniels, Garfield, McCone, Prairie, and Richland) (U.S. Department of Commerce, 2012). Populations in Roosevelt and Rosebud counties were more diverse in 2010 with large American Indian populations from the Cheyenne and Sioux tribes. Roosevelt and Rosebud counties 2010 populations were made up of 37% and 61% White alone, 49% and 33% American Indian alone, and 13% and 3% two or more races (U.S. Department of Commerce, 2012). While the percent of Montana residents (14.5%) living below the poverty line in 2010 was comparable to the nation poverty rate (13.8%), the poverty rate of the seven-county region in eastern Montana (17%) was above state and national levels. The relatively high regional poverty rate was driven by poverty levels in Prairie (16.9%), Roosevelt (21.5%), and Rosebud (18.5%) counties; while poverty in Daniels (14.1%), Garfield (10.7%), McCone (8.6), and Richland (13.5%) counties remained relatively low in 2010 (U.S. Department of Commerce, 2012).

The social environment of these counties is described in detail in the Socioeconomic Baseline Report for the Miles City Field Office RMP and EIS (prepared for the DOI, BLM, MCFO, June, 2005).

3.18.2 Economics

Certain existing demographic and economic features influence and define the nature of local economic and social activity. Among these features are the local population, the presence and proximity of cities or regional business centers, longstanding industries, infrastructure, predominant land and water features, and unique area amenities. Several additional parcels in McCone, Power River, Prairie, Richland and Roosevelt counties have been nominated for leasing in the October 2014 lease sale. While the majority of nominated land is unoccupied there are social and economic linkages which connect nominated parcels to communities in the surrounding area. To examine how leasing proposed under the alternatives will affect the local economy, the analysis area was expanded to include Williams County, North Dakota since Williston, ND is the largest business center near the affected communities, especially for oil and gas related activities, and is the major oil and gas service center for activity in the five counties above. Custer and Dawson counties in Montana were also included to create a contiguous analysis area.

In 2012, the 8-county analysis area was estimated to have a total population of 74,192 people, with 32,624 households earning an average annual household income of $149,626 (IMPLAN, 2014). Twenty-five percent of the area's total population lived in Williston, ND (18,532 people). In 2012, the 8-county area economy supported approximately 71,948 jobs in 183 industrial sectors, equating to approximately 2.3 people or 2.2 jobs per household. The top five industries operating in the local economy included: support activities for oil and gas operations, wholesale trade, drilling oil and gas wells, State and local government, and truck transportation (IMPLAN, 2014). A large share of the economic activity in the region occurs in Williams County which contains Williston, ND, the largest business center and the epicenter of recent oil and gas exploration and development.

Parcels nominated for leasing in October 2014 are located in the eastern Montana counties of McCone, Powder River, Prairie, Richland and Roosevelt. Between 2009 and 2013, these counties produced an annual average of 16.4 million bbls of oil and 16.5 million mcf of natural gas, with the majority of production occurring in Richland County. Over the last 24 months (4/2012-4/2014), the Montana Board of Oil and Gas reported that 372 permits for activities associated with oil and gas wells were processed for these five counties. Of the 372 permits processed for this area, 35% were associated with existing producing wells and 28% were related to recently spudded wells. While these permits can be associated with several types of well, only 4% were reported to be unrelated to oil (i.e natural gas, injection or monitoring, or dry hole) (MT DNRM, 2014). While some oil and gas related activities have been permitted in the Southeastern county of Powder River, more than 99% of permitted activity is associated with wells in the Three Forks Group. These subsurface deposits stretch across the Williston Basin from southern Saskatchewan, Canada to eastern Montana and western North Dakota. The overwhelming majority of recently completed wells are located in the sub-unit of the Three-Forks known as the Bakken formation.

The widespread adoption of horizontal drilling and other recent technological advances have significantly increased the capability and cost effectiveness of extracting fluid minerals across the Williston Basin. The recent surge of interest in commercial development of the Bakken's deposits has rapidly transformed the region's physical, cultural and economic landscapes. Eastern Montana and Western North Dakota have become increasingly specialized in industries that support and service the oil and gas sector, enabling the oil and gas industry to become the driving force behind the region's economy. The exploration, development, and production of fluid minerals directly and indirectly support thousands of jobs and millions of dollars in labor income throughout Eastern Montana and Western North Dakota. Although Federal minerals in the five counties with parcels nominated for leasing are associated with only a fraction of the region's oil and gas activity, the leasing and development of these minerals supports local employment and income and generates public revenue for many surrounding communities. The economic contributions of Federal fluid minerals are largely influenced by the number of acres leased and estimated levels of production and can be measured in terms of the jobs, income, and public revenue it generates.

Mineral rights can be owned by private individuals, corporations, Indian tribes, or by local, State, or Federal Governments. Typically companies specializing in the development and extraction of oil and gas lease the mineral rights for a particular parcel from the owner of the mineral rights. As of April, 2014, 434,866 acres were leased from the BLM for oil and gas development in McCone, Powder River, Prairie, Richland, and Roosevelt counties. Federal oil and gas leases are generally issued for 10 years unless drilling activities result in one or more producing wells or the lease is part of a collective agreement and incorporated into a field or unit. Once production of federal minerals from a lease has begun, the lease is considered to be held by production and the lessee is required to make royalty payments to the Federal Government. Of 434,866 acres leased from the BLM in the five counties, 57,664 acres were held by production at the time of this analysis.

Leasing mineral rights for the development of Federal minerals generates public revenue through the bonus bids paid at lease auctions and annual rents collected on leased parcels not held by production. Nominated parcels approved for leasing are offered by the BLM at a minimum rate of $2.00 per acre at the lease sale. These sales are competitive and parcels with high potential for oil and gas production command bonus bids in excess of the minimum bid. Auctions for mineral rights from 2009 to 2013 in the five counties have yielded an average bonus bid of $295 per acre. In addition to bonus bids, lessees are required to pay rent annually until production begins on the leased parcel, or until the lease expires. These rent payments are equal to $1.50 an acre for the first five years and $2.00 an acre for the second five years of the lease. Total annual lease bonus and rental revenue to the Federal Government from leasing Federal minerals in the five counties with nominated parcels is estimated to be approximately $865,000.

Forty-nine percent of these Federal leasing revenues from public domain minerals are distributed to the State who distributes 25 percent of federal revenue from public domain minerals back to the counties where the leases exist. About 94 percent of the leased Federal minerals within the Miles City Field Office are leased on public domain minerals. With federally acquired minerals (acquired under Bankhead Jones authority), 25 percent of Federal revenues are distributed directly to the appropriate counties. The Federal Government collects an estimated annual average of about $865,000 in bonus bids and rent from BLM leased minerals in the five counties. Under current conditions, it is estimated that about $411,000 in public revenue is redistributed back to the State who then distributes a portion of this revenue back to McCone, Powder River, Prairie, Richland and Roosevelt Counties. Between leasing revenue collected from public domain and acquired minerals, it is estimated that these five counties receive more than $112,000 from federal mineral leasing auction and rent revenue on annual average.

As mentioned above, Federal oil and gas production in Montana is subject to production taxes or royalties. The Federal oil and gas royalties on production from public domain minerals equal 12.5 percent of the value of production (43 CFR 3103.3.1). Forty-nine percent of these royalties from public domain minerals are distributed to the State, of which 25 percent is distributed back to the county of production (Title 17-3-240, MCA). If production comes from acquired Federal minerals under the Bankhead Jones authority, 25 percent of the Federal revenues are distributed directly to the counties of production.

Although the MCFO's October 2014 lease sale could result in additional mineral leasing in McCone, Powder River, Prairie, Richland, and Roosevelt counties, many of the workers and companies likely to provide support services for the exploration and development of newly leased minerals will spread throughout an 8-county area which includes Williams, ND and Custer and Dawson, MT. The economic contribution of oil and gas related activities to this 8-county local economy can be measured by estimating the employment and labor income generated by 1) payments to counties associated with the leasing and rent of Federal minerals, 2) local royalty payments associated with production of Federal oil and gas, and 3) economic activity generated from drilling and associated activities. Activities related to oil and gas leasing, exploration, development, and production form a basic industry that brings money into the State and region and creates jobs in other sectors. As of 2012, the extraction of oil and natural gas (NAICS sector 20), drilling oil and gas wells (NAICS sector 28), and support activities for oil and gas operations (NAICS sector 29) supported an estimated 14,280 jobs1 and $1.57 billion in employee compensation and proprietor income in the 8-county local economy (IMPLAN, 2014).

Currently, the BLM leases 434,866 acres of Federal minerals in McCone, Powder River, Prairie, Richland, and Roosevelt counties. Total Federal revenues from Federal oil and gas leasing, rents, and royalty payments associated with the leasing of these Federal minerals averages an estimated $12 million. Federal revenues disbursed to the State of Montana on annual average is estimated $5.8 million per year and those redistributed back to the five counties are estimated to be $1.6 million on annual average. These revenues help fund traditional county functions such as enforcing laws, administering justice, collecting and disbursing tax funds, providing for orderly elections, maintaining roads and highways, providing fire protection, and/or keeping records. Other county functions that may be funded include administering primary and secondary education and operating clinics/hospitals, county libraries, county airports, local landfills, and county health systems.

On annual average the leasing, development, and extraction of Federal minerals administered by the BLM supports 46 local jobs (full and part-time) and about $3 million in local labor income within the 8-county local economy. This amounts to about 0.06 percent of the local employment

[1] IMPLAN job estimates are not full-time equivalents and include all full-time, part-time, and temporary positions supported oil and gas activities within the planning area. These activities may support, or partially support a number of jobs annually. In this respect, 1 job in IMPLAN lasting 12 months = 2 jobs lasting 6 months each = 3 jobs lasting 4 months

and 0.06 percent of local labor and proprietor's income. Table 13 shows the current contributions of leasing BLM oil and gas minerals and the associated exploration, development, and production of the MCFO of BLM oil and gas minerals to the eight counties that make up the local economy.

Table 13. Current Contributions of BLM Oil and Gas Leasing, Exploration, Development, and Production to the 8-County Local Economy

Industry	Employment (Jobs)		Labor Income (Thousands of 2012 dollars)	
	Area Totals	BLM O&G-Related	Area Totals	BLM O&G-Related
Agriculture	5,737	0	$148,789	$1
Mining	14,442	17	$1,583,665	$1,501
Utilities	416	0	$46,173	$27
Construction	6,051	3	$481,624	$271
Manufacturing	1,295	0	$77,629	$5
Wholesale Trade	4,097	1	$412,553	$57
Transportation & Warehousing	4,925	1	$441,881	$34
Retail Trade	5,407	2	$203,717	$67
Information	554	0	$25,846	$12
Finance & Insurance	1,938	1	$70,248	$23
Real Estate & Rental & Leasing	1,958	0	$173,992	$26
Prof, Scientific, & Tech Services	2,371	1	$151,847	$72
Mngt of Companies	41	0	$3,541	$2
Admin, Waste Mngt & Rem Serv	1,591	1	$78,164	$20
Educational Services	578	0	$10,752	$4
Health Care & Social Assistance	4,513	2	$210,468	$81
Arts, Entertainment, and Rec	1,040	0	$15,411	$3
Accommodation & Food Services	4,278	1	$108,610	$30
Other Services	3,141	1	$98,698	$31
Government	7,576	14	$371,145	$659
Total	71,948	46	$4,714,754	$2,927
BLM as Percent of Total	---	0.06%	---	0.06%

IMPLAN, 2014 database

4.0 ENVIRONMENTAL IMPACTS

4.1 Assumptions and Reasonably Foreseeable Development Scenario Summary

This chapter describes the environmental effects (direct, indirect, and cumulative) that would result from the alternatives. This analysis is tiered to the final environmental impact statement (EIS) for the ~~Dillon RMP/ROD~~ Big Dry Resource Management Plan (RMP/EIS) of April 1996 and the Powder River RMP/EIS of March 1985, as amended. The analysis contained within ~~that~~ the RMP/FEISs remains adequate. The RMPs determined which areas are available for oil and gas leasing and under what conditions those leases are to be offered and sold.

The act of leasing parcels would not impact the resources. The only direct effects of leasing are creation of valid existing right and related to revenue generated by the lease sale receipts.

Potential indirect effects associated with a lease sale would result from any future developments. The BLM assumes there is a high interest in development of any leased parcels but, even if lease parcels are leased, it is speculative to assume development would actually occur, and if so, it is speculative to assume where specific wells would be drilled and where facilities would be placed. This would not be determined until the BLM receives an APD in which detailed information about proposed wells and facilities would be provided for particular leases.

Upon receipt of an APD, the BLM would initiate a more site-specific NEPA analysis with public review opportunities to more fully analyze and disclose site-specific effects of specifically identified activities. In all potential exploration and development scenarios, the BLM would require the use of BMPs documented in "Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development" (USDI and USDA 2007), also known as the "Gold Book." The BLM could also identify APD COAs, based on site-specific analysis that could include moving the well location, restrict timing of the project, or require other reasonable measures to minimize adverse impacts (43 CFR 3101.1-2 Surface use rights; Lease Form 3100-11, Section 6) to protect sensitive resources, and to ensure compliance with laws, regulations, and land use plans.

For split-estate leases, the BLM would notify the private landowners that oil and gas exploration or development activities are proposed on their lands and they are encouraged to attend the onsite inspection to discuss the proposed activities. In the event of activity on such split estate leases, the lessee and/or operator would be responsible for adhering to BLM requirements as well as reaching an agreement with the private surface landowners regarding access, surface disturbance, and reclamation.

The RFD for this EA (Appendix C) is based on information contained in the RFD developed in 2005 and revised in 2012 for the MCFO RMP. The RFD prepared for the MCFO RMP contains the number of potential oil and gas wells that could be drilled and produced in the MCFO area and used to analyze the potential number of wells drilled for the 18 nominated lease parcels. The projected number of wells is used to conduct analysis for economic resources. These well numbers are only an estimate based on historical drilling and geologic data. A detailed description of the RFD forecast for this EA is found in Appendix C.

No surface disturbance would occur as a result of issuing leases. For analysis purposes, cultural resources use the potential number of acres disturbed by exploration and development activities is shown in Tables D-1 in Appendix D to determine the number of cultural site potentially impacted within the nominated lease parcels. The potential acres of disturbance reflect acres typically disturbed by construction, drilling, and production activities, including infrastructure installation throughout the MCFO. Typical exploration and development activities and associated acres of disturbance were used as assumptions for analysis purposes in this EA.

The assumptions were not applied to Alternative A because the lease parcels would not be offered for lease; therefore, no wells would be drilled or produced on the lease parcel, and no surface disturbance would occur on those lands from exploration and development activities).

Environmental consequences are discussed below by alternative to the extent possible at this time for the resources described in Chapter 3. As per NEPA regulations at 40 CFR 1502.14(f), 40 CFR 1502.16(h), and 40 CFR 1508.20, mitigation measures to reduce, avoid, or minimize potential impacts are identified by resource below.

4.2 Alternative A (No Action Alternative)

4.2.1 Direct Effects Common to All Resources, not including Economics

Under Alternative A, the 18 parcels, covering 7,945.28 surveyed Federal mineral acres (3,637.97 surveyed BLM administered surface and 4,307.31 surveyed private surface), would not be offered for competitive oil and gas lease sale. Under this alternative, the State and private minerals could still be leased in surrounding areas. Surface management would remain the same and ongoing oil and gas development would continue on surrounding Federal, private, and State leases.

There would not be new impacts from oil and gas exploration or production activities on the Federal lease parcel lands at this time. No additional natural gas or crude oil would enter the public markets, and no royalties would accrue to the Federal or State treasuries from the parcel lands. The No Action Alternative would result in the continuation of the current land and resource uses on the lease parcels.

Except for Economic resources, described below, no further analysis of the No Action Alternative is presented for resources on parcel lands.

4.2.2 Economics

4.2.2.1 Direct and Indirect Effects:

The economic contributions of activities associated with oil and gas development on BLM administered Federal minerals are measured in terms of the employment and labor income generated by 1) payments to counties associated with the leasing and rent of Federal minerals, 2) royalty payments associated with production of Federal oil and gas, and 3) economic activity generated from drilling and associated activities. The first two described contributions would occur upon issuance of the lease; the third contribution would only occur if development occurred. Forward and backward linkages between businesses and people in communities surrounding parcels leased for the development of Federal minerals has enabled the oil and gas industry to attract new revenue to the region, growing the local economy and creating new employment and income opportunities in a wide range of industrial sectors. Table 14 is a summary of local revenues, employment, and labor income impacts of each alternative.

Alternative A is the no action alternative. Under Alternative A, no additional parcels would be leased and no additional public revenue would be generated. The economic contributions of activities associated with oil and gas development would remain consistent with existing conditions described in the Economics section of Chapter 3. Economic effects are summarized and displayed in comparative form in Table 14.

Table 14. Summary Comparison of Estimated Average Annual Economic Impacts

Alternative	Acres Leased	Change in Local Revenue to Counties	Change in Total Employment (full and part-time jobs)	Change in Total Labor Income
A	0	0	0	0
B	7,945	$38,399	2	$61,000
C	~~1,397~~ 1,197.34	$5,465	0	$12,000

***These impacts would be in addition to impacts from existing Federal leases, rents, royalties and related activities.**

4.2.2.2 Cumulative Effects:

Cumulative Effects:

The lack of measurable direct and indirect effects to economic conditions under the No Action Alternative translates to a lack of measurable cumulative effects. Under this alternative the BLM will not make any additional Federal minerals available for leasing and Federal minerals leased from the MCFO will likely continue at existing levels. Current levels of BLM mineral leasing in McCone, Powder River, Prairie, Richland, and Roosevelt counties support jobs and income in the 8-county local economy and the economic contributions of oil and gas activities associated with these leases will continue to be similar to those discussed in Chapter 3.

Cumulative economic impacts associated with Federal mineral leasing under the alternatives are shown below in Table 15 and Table 16.

Table 15. Summary Comparison of Cumulative Annual Economic Impacts by Alternative

Activity	A	B	C
Existing Acres leased	434,866	434,866	434,866
Acres that would be leased based on this EA	0	7,945	~~1,397~~ 1,197
Total acres leased	434,866	442,811	436,263
Acres held by production	57,664	57,664	57,664
Total acres leased for which lease rents would be paid	377,202	385,147	378,599
Total average annual Federal lease and rental revenue	$660,104	$954,961	$871,313
Average annual distribution to State*	$313,945	$454,179	$414,397
Average annual distribution to Counties**	$85,912	$124,288	$113,401
Average annual oil production (bbl)***	868,935	884,810	871,726

Average annual gas production (MCF)***	2,188,938	2,228,930	2,195,970
Total Average annual Federal O&G royalties	$11,250,381	$11,455,925	$11,286,522
Average annual distribution to State*	$5,350,681	$5,448,438	$5,367,870
Average annual distribution to Counties**	$1,464,237	$1,490,989	$1,468,941
Total average annual Federal Revenues	$11,910,484	$12,410,885	$12,157,835
Total average annual State Revenues	$5,664,626	$5,902,617	$5,782,267
Total average annual revenue distributed to counties	$1,550,149	$1,615,277	$1,582,342

*49 percent of Federal revenue from public domain minerals and 25 percent of Federal revenue from acquired minerals are distributed back to the State.
**Montana distributes 25 percent of public domain revenue and all of acquired mineral revenue received from the Federal Government back to the counties where revenue was generated.
***Estimated as BLM's share of Federal minerals production in McCone, Powder River, Prairie, Richland and Roosevelt counties.

Table 16. Summary Comparison of Employment and Income Supported by BLM Minerals in McCone, Powder River, Prairie, Richland and Roosevelt Counties.

Industry	Total Jobs Supported			Total Income Supported ($1000)		
	Alt. A	Alt. B	Alt. C	Alt. A	Alt. B	Alt. C
Total Contribution of BLM Minerals	45	47	45	$2,894	$2,969	$2,920

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4.3 Alternative B (Proposed Action)

Under Alternative B, 18 lease parcels of Federal minerals for oil and gas leasing, covering 7,945.28 surveyed Federal mineral acres (3,637.97 surveyed BLM administered surface and 4,307.31 surveyed private surface) would be offered for competitive oil and gas lease sale. No parcels would be deferred.

4.3.1 Direct Effects Common to All Resources

The action of leasing the parcels in Alternative B would, in and of itself, have no direct impact on resources. Direct effects of leasing are the creation of a valid existing right and those related to the revenue generated by the lease sale receipts.

4.3.2 Indirect Effects Common to All Resources

Any potential effects on resources from the sale of leases would occur during lease exploration and development activities, which would be subject to future BLM decision-making and NEPA analysis upon receipt of an APD or sundry notice.

Oil and gas exploration and development activities such as construction, drilling, production, infrastructure installation, vehicle traffic and reclamation could be indirect effects from leasing the lease parcels in Alternative B. As mentioned above, it is speculative to make assumptions about whether a particular lease parcel would be sold and, even if so, it is speculative to assume when, where, how, or if future surface disturbing activities associated with oil and gas exploration and development such as well sites, roads, facilities, and associated infrastructure would be proposed. It is also not known how many wells, if any, would be drilled and/or completed, the types of technologies and equipment would be used and the types of infrastructure needed for production of oil and gas. Thus, the types, magnitude and duration of potential impacts cannot be precisely quantified at this time, and would vary according to many factors.

Typical impacts to resources from oil and gas exploration and development activities such as well sites, roads, facilities, and associated infrastructure are described in the Miles City Oil & Gas Amendment/EIS (1994), the Big Dry RMP (1996), the Powder River RMP (1985), the Montana Statewide Oil & Gas Amendment/EIS (2003) and the Supplement (2008) to that document.

4.3.3 Air Resources
4.3.3.1 Direct and Indirect Effects
4.3.3.1.1 Air Quality
Leasing the parcels would have no direct impacts on air quality. Any potential effects from sale of lease parcels could occur at the time the leases are developed.

Potential impacts of development could include increased airborne soil particles blown from new well pads or roads; exhaust emissions from drilling equipment, compressors, vehicles, and dehydration and separation facilities, as well as potential releases of GHGs and VOCs during drilling or production activities. The amount of increased emissions cannot be precisely quantified at this time since it is not known for certain how many wells might be drilled, the types of equipment needed if a well were to be completed successfully (e.g., compressor, separator, dehydrator), or what technologies may be employed by a given company for drilling any new wells. The degree of impact would also vary according to the characteristics of the geologic formations from which production occurs, as well as the scope of specific activities proposed in an APD.

Current monitoring data show that criteria pollutants concentrations are below applicable air quality standards, indicating good air quality. The potential level of development and mitigation described below is expected to maintain this level of air quality by limiting emissions. In addition, pollutants would be regulated through the use of State-issued air quality permits or air quality registration processes developed to maintain air quality below applicable standards.

4.3.3.1.2 Greenhouse Gas Emissions at the MCFO and Project Scales
Sources of GHGs associated with development of lease parcels could include construction activities, operations, and facility maintenance in the course of oil and gas exploration, development, and production. Estimated GHG emissions are discussed for these specific aspects of oil and gas activity because the BLM has direct involvement in these steps. However, the current proposed activity is to offer parcels for lease. No specific development activities are currently proposed or potentially being decided upon for any parcels being considered in this EA. Potential development activities would be analyzed if the BLM receives an APD on any of the parcels considered here.

Anticipated GHG emissions presented in this section are taken from the Climate Change SIR, 2010. Data are derived from emission calculators developed by air quality specialists at the

BLM National Operations Center in Denver, Colorado, based on methods described in the Climate Change SIR (2010). Based on the assumptions summarized in the SIR for the MCFO RFD, Table 16 discloses projected annual GHG source emissions from BLM-permitted activities associated with the RFD.

Table 17. The BLM Projected Annual GHG Emissions Associated With Oil and Gas Exploration and Development Activity in the MCFO.

Source	BLM Long-Term GHG Emissions in tons/year				Emissions (metric tons/yr)
	CO_2	CH_4	N_2O	CO_2e	CO_2e
Conventional Natural Gas	158,154.7	1,572.8	1.2	190,984.1	173,817.6
Coal Bed Natural Gas	268,477.4	5,194.6	0.9	377,826.5	342.855.24
Oil	91,689.0	562.6	0.5	103,663.3	94,068.3
Total	**518,321.1**	**7,330**	**2.6**	**672,473.9**	**610,741.1**

To estimate GHG emissions associated with the action alternatives, the following approach was used:

1. The proportion of each alternative relative to the total RFD was calculated based on total acreage of parcels under consideration for leasing relative to the total acreage of Federal mineral acreage available for leasing in the RFD.
2. This ratio was then used as a multiplier with the total estimated GHG emissions for the entire RFD (with the highest year emission output used) to estimate GHG emissions for that particular alternative.

Under Alternative B, approximately 7,945 acres of lease parcels with Federal minerals would be leased. These acres constitute approximately 0.14 percent of the total Federal mineral estate of approximately 5,798,000 acres identified in the MCFO RFD. Therefore, based on the approach described above to estimate GHG emissions, 0.14 percent of the RFD for this EA total estimated BLM emissions of approximately 610,741 metric tons/year would be approximately 837 metric tons/year of CO_2e if the parcels within Alternative B were to be developed.

4.3.3.1.3 Climate Change

The assessment of GHG emissions and climate change is in its formative phase. As summarized in the Climate Change SIR, climate change impacts can be predicted with much more certainty over global or continental scales. Existing models have difficulty reliably simulating and attributing observed temperature changes at small scales. On smaller scales, natural climate variability is relatively larger, making it harder to distinguish changes expected due to external forcings (such as contributions from local activities to GHGs). Uncertainties in local forcings and feedbacks also make it difficult to estimate the contribution of GHG increases to observed small-scale temperature changes (Climate Change SIR 2010).

It is currently not possible to know with certainty the net impacts from lease parcel development on climate. The inconsistency in results of scientific models used to predict climate change at the global scale, coupled with the lack of scientific models designed to predict climate change on regional or local scales, limits the ability to quantify potential future impacts of decisions made at this level. It is therefore beyond the scope of existing science to relate a specific source of GHG emission or sequestration with the creation or mitigation of any specific climate-related environmental effects. Although the effects of GHG emissions in the global aggregate are well-documented, it is currently impossible to determine what specific effect GHG emissions resulting from a particular activity might have on the environment. For additional information on environmental effects typically attributed to climate change, please refer to the cumulative effects discussion below.

While it is not possible to predict effects on climate change of potential GHG emissions discussed above in the event of lease parcel development for alternatives considered in this EA, the act of leasing does not produce any GHG emissions in and of itself. Releases of GHGs could occur at the exploration/development stage.

4.3.3.2 Mitigation

The BLM encourages industry to incorporate and implement BMPs to reduce impacts to air quality by reducing emissions, surface disturbances, and dust from field production and operations. Measures would also be required as COAs on permits by either the BLM or the applicable State air quality regulatory agency. The BLM also manages venting and flaring of gas from Federal wells as described in the provisions of Notice to Lessees (NTL) 4A, Royalty or Compensation for Oil and Gas Lost.

Some of the following measures could be imposed at the development stage:

- flaring or incinerating hydrocarbon gases at high temperatures to reduce emissions of incomplete combustion;
- emission control equipment of a minimum 95 percent efficiency on all condensate storage batteries;
- emission control equipment of a minimum 95 percent efficiency on dehydration units, pneumatic pumps, produced water tanks;
- vapor recovery systems where petroleum liquids are stored;
- tier II or greater, natural gas or electric drill rig engines;
- secondary controls on drill rig engines;
- no-bleed pneumatic controllers (most effective and cost effective technologies available for reducing VOCs);
- gas or electric turbines rather than internal combustions engines for compressors;
- NO_x emission controls for all new and replaced internal combustion oil and gas field engines;
- water dirt and gravel roads during periods of high use and control speed limits to reduce fugitive dust emissions;
- interim reclamation to re-vegetate areas of the pad not required for production facilities and to reduce the amount of dust from the pads.
- co-located wells and production facilities to reduce new surface disturbance;
- directional drilling and horizontal completion technologies whereby one well provides access to petroleum resources that would normally require the drilling of several vertical wellbores;
- gas-fired or electrified pump jack engines;
- velocity tubing strings;

- cleaner technologies on completion activities (i.e. green completions), and other ancillary sources;
- centralized tank batteries and multi-phase gathering systems to reduce truck traffic;
- forward looking infrared (FLIR) technology to detect fugitive emissions; and
- air monitoring for NO_x and ozone.

More specific to reducing GHG emissions, Section 6 of the Climate Change SIR identifies and describes in detail commonly used technologies to reduce methane emissions from natural gas, coal bed natural gas, and oil production operations. Technologies discussed in the Climate Change SIR and as summarized below in Table 17 (reproduced from Table 6-2 in Climate Change SIR) display common methane emission technologies reported under the EPA Natural Gas STAR Program and associated emission reduction, cost, maintenance and payback data.

Table 18. Selected Methane Emission Reductions Reported Under the USEPA Natural Gas STAR Program [1]

Source Type / Technology	Annual Methane Emission Reduction [1] (Mcf/yr)	Capital Cost Including Installation ($)	Annual Operating and Maintenance Cost ($)	Payback (Years or Months)	Payback Gas Price Basis ($/Mcf)
Wells					
Reduced emission (green) completion	7,000 [2]	$1K – $10K	>$1,000	1 – 3 yr	$3
Plunger lift systems	630	$2.6K – $10K	NR	2 – 14 mo	$7
Gas well smart automation system	1,000	$1.2K	$0.1K – $1K	1 – 3 yr	$3
Gas well foaming	2,520	>$10K	$0.1K – $1K	3 – 10 yr	NR
Tanks					
Vapor recovery units on crude oil tanks	4,900 – 96,000	$35K – $104K	$7K – $17K	3 – 19 mo	$7
Consolidate crude oil production and water storage tanks	4,200	>$10K	<$0.1K	1 – 3 yr	NR
Glycol Dehydrators					
Flash tank separators	237 – 10,643	$5K – $9.8K	Negligible	4 – 51 mo	$7
Reducing glycol circulation rate	394 – 39,420	Negligible	Negligible	Immediate	$7
Zero-emission dehydrators	31,400	>$10K	>$1K	0 – 1 yr	NR
Pneumatic Devices and Controls					
Replace high-bleed devices with low-bleed devices					
End-of-life replacement	50 – 200	$0.2K – $0.3K	Negligible	3 – 8 mo	$7
Early replacement	260	$1.9K	Negligible	13 mo	$7
Retrofit	230	$0.7K	Negligible	6 mo	$7
Maintenance	45 – 260	Negl. to $0.5K	Negligible	0 – 4 mo	$7
Convert to instrument air	20,000 (per facility)	$60K	Negligible	6 mo	$7
Convert to mechanical control systems	500	<$1K	<$0.1K	0 – 1 yr	NR

Table 18. Selected Methane Emission Reductions Reported Under the USEPA Natural Gas STAR Program [1]

Source Type / Technology	Annual Methane Emission Reduction [1] (Mcf/yr)	Capital Cost Including Installation ($)	Annual Operating and Maintenance Cost ($)	Payback (Years or Months)	Payback Gas Price Basis ($/Mcf)
Valves					
Test and repair pressure safety valves	170	NR	$0.1K – $1K	3 – 10 yr	NR
Inspect and repair compressor station blowdown valves	2,000	<$1K	$0.1K – $1K	0 – 1 yr	NR
Compressors					
Install electric compressors	40 – 16,000	>$10K	>$1K	>10 yr	NR
Replace centrifugal compressor wet seals with dry seals	45,120	$324K	Negligible	10 mo	$7
Flare Installation	2,000	>$10K	>$1K	None	NR

Source: Multiple EPA Natural Gas STAR Program documents. Individual documents are referenced in Climate Change SIR (2010).

[1] Unless otherwise noted, emission reductions are given on a per-device basis (e.g., per well, per dehydrator, per valve, etc).

[2] Emission reduction is per completion, rather than per year.

K = 1,000

mo = months

Mcf = thousand cubic feet of methane

NR = not reported

yr = year

In the context of the oil sector, additional mitigation measures to reduce GHG emissions include methane reinjection and CO_2 injection. These measures are discussed in more detail in Section 6.0 of the Climate Change SIR (2010).

In an effort to disclose potential future GHG emission reductions that might be feasible, the BLM estimated GHG emission reductions based on the RFD for the MCFO. For emission sources subject to BLM (Federal) jurisdiction, the estimated emission reductions represent approximately 51 percent reduction in total GHG emissions compared to the estimated MCFO Federal GHG emission inventory (Climate Change SIR, as updated October 2010, Section 6.5 and Table 6-3). The emission reductions technologies and practices are identified as mitigation measures that could be imposed during development. Furthermore, the EPA is expected to promulgate new Federal air quality regulations that would require GHG emission reductions from many oil and gas sources.

4.3.4 Soil Resources

4.3.4.1 Direct and Indirect Effects

Leasing the parcels would have no direct impacts on soil resources. Any potential effects from the sale of leases would occur at the time the leases are developed.

Land uses associated with oil and gas exploration and development could cause surface disturbances. Such acts result in reduced ground cover, soil mixing, compaction, or removal, exposing soils to accelerated erosion by wind and water, resulting in the irretrievable loss of topsoil and nutrients and potentially resulting in mass movement or sedimentation. Surface disturbances also change soil structure, heterogeneity (variable characteristics), temperature regimes, nutrient cycling, biotic richness, and diversity. Along with this, mixed soils have decreased bulk density, and altered porosity, infiltration, air-water relationships, salt content, and pH (Perrow and Davy, 2003; Bainbridge 2007). Soil compaction results in increased bulk density, and reduced porosity, infiltration, moisture, air, nutrient cycling, productivity, and biotic activity (Logan 2001; 2003; 2007). Altering such characteristics reduces the soil system's ability to withstand future disturbances (e.g., wildfire, drought, high precipitation events, etc.).

The probability and magnitude of these effects are dependent upon local site characteristics, climatic events, and the specific mitigation applied to the project. Within 2-5 years following restoration, vegetative cover and rates of erosion would return to pre-disturbance conditions (FSEIS 2008). Exceptions would be sites that have a low potential for restoration (apx. less than 1 percent), which would require unconventional and/or site-specific restoration measures.

4.3.4.2 Mitigation

Measures would be taken to reduce, avoid, or minimize potential impacts to soil resources from exploration and development activities. Prior to authorization, proposed actions would be evaluated on a case-by-case basis and would be subject to mitigation measures in order to maintain the soil system. Mitigation would include avoiding areas poorly suited to reclamation, limiting the total area of disturbance, rapid reclamation, erosion/sediment control, soil salvage, decompaction, revegetation, weed control, slope stabilization, surface roughening, and fencing.

4.3.5 Water Resources

4.3.5.1 Direct and Indirect Effects

Leasing the parcels would have no direct impacts on water resources. Any potential effects from sale of lease parcels would occur at the time the leases are developed.

Surface Water:

The magnitude of the impacts to water resources would be dependent on the specific activity, season, proximity to waterbodies, location in the watershed, upland and riparian vegetation condition, effectiveness of mitigation, and the time until reclamation success. Surface disturbance effects typically are localized, short-term, and occur from the time of implementation through vegetation reestablishment. As acres of surface-disturbance increase within a watershed, so would the potential effects on water resources.

Oil and gas exploration and development of a lease parcel would cause the removal of vegetation, soil compaction, and soil disturbance in uplands within the watershed, 100-year floodplains of non-major streams, and non-riparian, ephemeral waterbodies. The potential effects from these activities would be accelerated erosion, increased overland flow, decreased infiltration, increased water temperature, channelization, and water quality degradation associated with increased sedimentation, turbidity, nutrients, metals, and other pollutants. Erosion potential could be further increased in the long term by soil compaction and low permeability surfacing (e.g., roads and well pads) which increases the energy and amount of overland flow and decreases infiltration, which in turn changes flow characteristics, reduces groundwater recharge, and increases sedimentation and erosion (MDEQ 2012).

Groundwater:
Spills or produced fluids could have long-term impacts to surface and ground water resources. Oil and gas exploration/development could potentially contaminate aquifers with salts, drilling fluids, fluids and gases from other formations, detergents, solvents, hydrocarbons, metals, and nutrients; change vertical and horizontal aquifer permeability; and increase hydrologic communication with adjacent aquifers (EPA 2004). Groundwater removal could result in a depletion of flow in nearby streams and springs if the aquifer is hydraulically connected to such features. Typically, produced water from conventional oil and gas wells is from a depth below useable aquifers or coal seams (FSEIS 2008).

Well bores would most likely pass through useable groundwater. Potential impacts to groundwater resources could occur if proper cementing and casing programs are not followed. This could include loss of well integrity, surface spills, or loss of fluids in the drilling and completion process. It is possible for chemical additives used in drilling activities to be introduced into the water-producing formations without proper casing and cementing of the well bore. Changes in porosity or other properties of the rock being drilled through can result in the loss of drilling fluids. When this occurs, drilling fluids can be introduced into groundwater without proper cementing and casing. Site specific conditions and drilling practices determine the probability of this occurrence and determine the groundwater resources that could be impacted. In addition to changing the producing formations' physical properties by increasing the flow of water, gas, and/or oil around the well bore, hydraulic fracturing can also introduce chemical additives into the producing formations. Types of chemical additives used in drilling activities may include acids, hydrocarbons, thickening agents, lubricants, and other additives that are operator- and location-specific. These additives are not always used in these drilling activities and some are likely to be benign such as bentonite clay and sand. Concentrations of these additives also vary considerably since different mixtures can be used for different purposes in oil and gas development and even in the same well bore. If contamination of aquifers from any source occurs, changes in groundwater quality could impact springs and residential wells that are sourced from the affected aquifers. Onshore Order #2 requires that the proposed casing and cementing programs shall be conducted as approved to protect and/or isolate all usable water zones.

Known water bearing zones in the lease area are protected by drilling requirements and, with proper practices, contamination of ground water resources is highly unlikely. Casing along with cement is extended well beyond fresh-water zones to insure that drilling fluids remain within the well bore and do not enter groundwater.

Potential impacts to ground water at site specific locations are analyzed through the NEPA review process with public involvement at the development stage when the APD is submitted. This process includes geologic and engineering reviews to ensure that cementing and casing programs are adequate to protect all downhole resources.

All water used would have to comply with Montana State water rights regulations and a source of water would need to be secured by industry that would not harm senior water rights holders.

4.3.5.2 Mitigation

Stipulations addressing steep slopes, waterbodies, streams, 100-year floodplains of major rivers, and riparian areas would minimize potential impacts and would be included with the lease when necessary (Appendix A). In the event of exploration or development, measures would be taken to reduce, avoid, or minimize potential impacts to water resources including application of appropriate mitigation. Mitigation measures that minimize the total area of disturbance, control wind and water erosion, reduce soil compaction, maintain vegetative cover, control nonnative species, and expedite rapid reclamation (including interim reclamation) would maintain water resources.

Methods to reduce erosion and sedimentation could include reducing the area of surface disturbance; installing and maintaining adequate erosion control; proper road design, road surfacing, and culvert design; road/infrastructure maintenance; use of low water crossings; and use of isolated or bore crossing methods for waterbodies and floodplains. In addition, applying mitigation to maintain adequate, undisturbed, vegetated buffer zones around waterbodies and floodplains could reduce sedimentation and maintain water quality. Appropriate well completion, the implementation of Spill Prevention Plans, and Underground Injection Control regulations would mitigate groundwater impacts. Site-specific mitigation and reclamation measures would be described in the COAs.

4.3.6 Vegetation Resources

4.3.6.1 Direct and Indirect Effects

Leasing the parcels would have no direct impacts on vegetation resources. Any potential effects from sale of lease parcels could occur at the time the leases are developed.

Impacts to vegetation depend on the vegetation type/community, soil community and the topography of the lease parcels. Disturbance to vegetation is of concern because protection of soil resources, maintenance of water quality, conservation of wildlife habitat, and livestock production capabilities could be diminished or lost over the long-term through direct loss of vegetation (including direct loss of both plant communities and specific plant species).

Other direct impacts, such as invasive species invasion, could result in loss of desirable vegetation. Invasive species and noxious weeds could also reduce livestock grazing forage, wildlife habitat quality, and native species diversity. In addition, invasive species are well known for changing fire regimes.

Additionally, surface disturbing activities directly affect vegetation by destroying habitat, churning soils, impacting biological crusts, disrupting seedbanks, burying individual plants, and generating sites for competitive species. Other vegetation impacts could also be caused from soil erosion and result in loss of the supporting substrate for plants, or from soil compaction resulting in reduced germination rates. Impacts to plants occurring after seed germination but prior to seed set could be particularly harmful as both current and future generations would be affected.

Fugitive dust generated by construction activities and travel along dirt roads could affect nearby plants by depressing photosynthesis, disrupting pollination, and reducing reproductive success. Oil, fuel, wastewater or other chemical spills could contaminate soils as to render them temporarily unsuitable for plant growth until cleanup measures were fully implemented. If cleanup measures were less successful, longer term vegetation damage could be expected.

Oil and gas development activity could reduce BLM's ability to manage livestock grazing while meeting or progressing towards meeting the Standards of Rangeland Health. Development and associated disturbances could reduce available forage or alter livestock distribution leading to overgrazing or other localized excess grazing impacts. Construction of roads, especially in areas of rough topography could cause significant changes in livestock movement and fragment suitable habitat for some plant communities.

4.3.6.2 Mitigation

Mitigation would be addressed at the site specific APD stage of exploration and development. If needed, COAs would potentially include, but not limited to, revegetation with desirable plant species, soil enhancement practices, direct live haul of soil material for seed bank revegetation, reduction of livestock grazing, fencing of reclaimed areas, and the use of seeding strategies consisting of native grasses, forbs, and shrubs. In areas infested with noxious weeds, weed management plans with special conditions would be required.

4.3.7 Riparian-Wetland Habitats

4.3.7.1 Direct and Indirect Effects

Leasing the parcels would have no direct impacts on riparian-wetland habitats. Any potential effects from sale of lease parcels could occur at the time the leases are developed.

The exploration and development of oil and gas within uplands or adjacent to riparian-wetland areas could reduce riparian-wetland functionality by changing native plant productivity, composition, richness, and diversity; accelerating erosion; increasing sedimentation; and changing hydrologic characteristics. Impacts that reduce the functioning condition of riparian and wetland areas could impair the ability of riparian/wetland areas to reduce nonpoint source pollution (MDEQ 2012) and provide other ecosystem benefits. The magnitude of these effects would be dependent on the specific activity, season, proximity to riparian-wetland areas, location in the watershed, upland and riparian-wetland vegetation condition, mitigation applied, and the time until reclamation success. Increases in erosion are typically localized, short term, and occur from the beginning of implementation through vegetation reestablishment. As acres of surface disturbance increase within a watershed, so could the effects on riparian-wetland resources.

4.3.7.2 Mitigation

Stipulations addressing steep slopes, waterbodies, streams, 100-year floodplains of major rivers, and riparian areas would minimize potential impacts and would be included with the lease when necessary (Appendix A). In the event of exploration or development, site-specific mitigation measures would be identified which would avoid or minimize potential impacts to riparian-wetland areas at the APD stage. Mitigation measures that minimize the total area of disturbance, control wind and water erosion, reduce soil compaction, maintain vegetative cover, control nonnative species, maintain biodiversity, maintain vegetated buffer zones, and expedite rapid reclamation (including interim reclamation) would maintain riparian-wetland resources.

4.3.8 Special Status Plant Species
4.3.8.1 Direct and Indirect Effects
Leasing the parcels would have no direct impacts on special status plant species. Any potential effects from the sale of leases could occur at the time the leases are developed.

4.3.8.2 Mitigation
Stipulations applied to wildlife resources, steep slopes, waterbodies, streams, 100-year floodplains of major rivers, riparian areas, and wetlands would likely also provide protections for special status plant species. Proposed development would be analyzed on a site-specific basis prior to approval of oil and gas exploration or development activities at the APD stage**.** Mitigation would also be addressed at the site-specific APD stage. Surveys to determine the existence of federally listed species could occur on BLM-administered surface or minerals prior to approval of exploration and development activities at the APD stage.

4.3.9 Wildlife
4.3.9.1 Direct and Indirect Effects
Leasing the parcels would have no direct impacts on wildlife. Any potential effects from the sale of lease parcels would occur at the time the leases are developed.

The use of standard lease terms and stipulations on these lands (Appendix A) would minimize, but not preclude impacts to wildlife. Oil and gas development which results in surface disturbance could directly and indirectly impact aquatic and terrestrial wildlife species. These impacts would include loss or reduction in suitability of habitat, improved habitat for undesirable (non-native) competitors, species or community shift to species or communities more tolerant of disturbances, nest abandonment, mortalities resulting from collisions with vehicles and power lines, electrocutions from power lines, barriers to species migration, habitat fragmentation, increased predation, habitat avoidance, and displacement of wildlife species resulting from human presence. The scale, location, and pace of development, combined with implementation of mitigation measures and the tolerance of the specific species to human disturbance all influence the severity of impacts to wildlife species and habitats, including threatened, endangered, candidate, proposed, and other special status species.

4.3.9.1.1 Threatened, Endangered, and Candidate Species
Habitat within the lease parcels exists to support USFWS threatened, endangered, or candidate, species including the whooping crane, pallid sturgeon, sage grouse, and Sprague's pipit.

The BLM has determined that the act of issuing leases within the whooping crane migration corridor will not affect the whooping crane. However, impacts to whooping cranes are possible from subsequent oil and gas development activities permitted at the APD stage. At this time, stipulations do not currently exist to protect any known whooping crane migration staging areas. Line strikes, collisions with vehicles, habitat fragmentation, and other anthropogenic activities could disturb, displace, or cause direct mortality of whooping cranes.

Therefore, if development on any of the leases within the whooping crane migration corridor is proposed within suitable whooping crane staging, stopover or roosting habitat, BLM would consult with the USFWS pursuant to section 7(a)(2) of ESA. An outcome of the consultation process could be that conditions of approval are attached to the permit or the permit could not be approved. Other BMP's could also be developed through consultation, including minimizing disturbance, adherence to Avian Powerline Interaction Committee (APLIC) guidelines, and others as deemed appropriate.

Pallid sturgeon individuals and their habitat would occur in or near lease parcel MTM 105431-H6, H8, HA, and HB (based on year-round range and observation maps (MTNHP)) and have the potential to be affected by the development of oil and gas wells. Potential impacts from development could include: overland oil spills, underground spills from activities associated with horizontal drilling or other practices, spills from drilling mud or other extraction and processing chemicals, and surface disturbance activities that create a localized erosion zone. Oil spills and other pollutants from the oil extraction process could harm the endangered pallid sturgeon in two different ways. First, toxicological impacts from direct contact could have immediate lethal effects to eggs, juveniles, and adults. Second, toxic effects to lower food web levels (e.g. aquatic macro-invertebrates) could indirectly affect the pallid sturgeon species by degrading water quality and degrading or eliminating food resources. Additionally, surface disturbing activities that decrease the availability or input of organic material, large woody debris, and trees could decrease cover, food-web compartments and fluxes, and holding areas for pallid sturgeon. Other aquatic species could experience the same type of direct and indirect impacts.

Currently, in the Big Dry RMP there are no stipulations specific to Pallid sturgeon habitat. However, a floodplain stipulation (NSO 11-2) would not allow surface occupancy in the 100-year floodplain boundary of the Missouri and Yellowstone Rivers. The BLM has determined that issuing a lease for the four parcels along the Missouri River will have no effect on the pallid sturgeon. If development were to occur, additional mitigation would be included as conditions of approval at the APD stage. These conditions include the placement of earthen berms and oil skimmers (a culvert device placed in drainages which is intended to block oil from entering streams) to help protect pallid sturgeon habitat in case of oil spills by greatly reducing the potential for spills to reach pallid sturgeon habitat. If oil and gas development is proposed for these four parcels, BLM would consult with the USFWS pursuant to section 7(a)(2) of ESA.

Sage grouse are offered species specific protections through a stipulation. Under Alternative B, ¼ mile NSO buffers and 2 mile timing buffers would apply where relevant. Based on research, these stipulations for sage grouse are considered ineffective to ensure that sage grouse can persist within fully developed areas. With regard to existing restrictive stipulations applied by the BLM, (Walker et al. 2007a) research has demonstrated that the 0.4-km (0.25 miles) NSO lease stipulation is insufficient to conserve breeding sage-grouse populations in fully developed gas fields because this buffer distance leaves 98 percent of the landscape within 3.2 km (2 miles) open to full-scale development. Full-field development of 98 percent of the landscape within 3.2 km (2 miles) of leks in a typical landscape in the Powder River Basin reduced the average probability of lek persistence from 87 percent to 5 percent (Walker et al. 2007a).

Other studies also have assessed the efficacy of existing BLM stipulations for sage grouse. Impacts to leks from energy development are most severe near the lek, and remained discernable out to distances more than 6 km (3.6 miles) (Holloran 2005, Walker et al. 2007a), and have resulted in the extirpation of leks within gas fields (Holloran 2005, Walker et al. 2007a).

Holloran (2005) shows that lek counts decreased with distance to the nearest active drilling rig, producing well, or main haul road, and that development influence counts of displaying males to a distance of between 4.7 and 6.2 km (2.9 and 3.9 miles). All well-supported models in Walker et al. (2007a) indicate a strong effect of energy development, estimated as proportion of development within either 0.8 km (0.5 miles) or 3.2 km (2 miles), on lek persistence. Buffer sizes of 0.25 mi., 0.5 mi., 0.6 mi. and 1.0 mi. result in an estimated lek persistence of 5 percent, 11 percent, 14 percent, and 30 percent. Lek persistence in the absence of CBNG development averages approximately 85 percent. Models with development at 6.4 km (4 miles) had considerably less support, but the regression coefficient indicated that impacts were still apparent out to 6.4 km (4 miles) (Walker et al. 2007a). Tack (2009) found impacts of energy development on lek abundances (numbers of males per lek) out to 7.6 miles.

The 2 mile timing stipulation attached to the respective parcels in this proposal only applies between March 1 to June 15, and development can occur within the 2 miles outside of those dates. Not all lease parcels would be expected to see full field development as noted in the range of RFD, although effects would most likely mirror these studies to some degree proportionate to the amount of development that occurs outside of the stipulated timeframe.

Noise has been shown to affect sage-grouse and associated sagebrush obligates. Sage-grouse are known to select highly visible leks with good acoustic properties. Effects to sage-grouse would be a decrease in numbers of males on leks and activity levels and lower nest initiation near oil and gas development. Sage-grouse numbers on leks within 1.6 km (1 mile) of coal bed natural gas compressor stations in Campbell County, Wyoming were shown to be consistently lower than on leks not affected by this disturbance (Braun et al. 2002). Holloran (2005), Holloran et al (2005a, 2005b), and Anderson (2005) reported that lek activity by sage-grouse decreased downwind of drilling activities, suggesting that noise had measurable negative impacts on sage-grouse. The actual level of noise (measured in decibels) that would not affect greater sage-grouse breeding and nesting activities is presently unknown. Timing restriction (TL 13-3) is applied within 2 miles of leks within the MCFO, which provides some mitigation for noise level effects to sage-grouse during this timeframe.

Recent inventories for sage grouse leks have not been conducted within some of the parcels. Therefore, inventories would be conducted at the APD stage of development to determine the presence or absence of sage grouse leks. This alternative also includes the attachment of a sage grouse lease notice (LN 14-11) when the lease parcel is located within 2 miles of a lek. The lease notice would require an operator to implement specific measures to reduce impacts of oil and gas operations on sage grouse populations and habitat quality. The application of this lease notice would be expected to reduce, but not eliminate, impacts to sage grouse and habitats.

Energy development (oil, gas, and wind) and associated roads and facilities increase the fragmentation of grassland habitat. A number of studies have found that Sprague's pipits appear to avoid non-grassland features in the landscape, including roads, trails, oil wells, croplands, woody vegetation, and wetlands (Dale et al. 2009, pp. 194, 200; Koper et al. 2009, pp. 1287, 1293, 1294, 1296; Greer 2009, p. 65; Linnen 2008, pp. 1, 9-11, 15; Sutter et al. 2000, pp. 112-114). Sprague's pipits avoid oil wells, staying up to 350 meters (m) (1148 feet (ft.)) away (Linnen 2008, pp. 1, 9-11), magnifying the effect of the well feature itself. Oil and gas wells, especially at high densities, decrease the amount of habitat available for breeding territories. (Federal Register: September 15, 2010 (Volume 75, Number 178))

Potential suitable habitat exists for the Sprague's pipit across some of the proposed lease parcels; however, inventories have not been conducted within the parcels. Therefore, inventories would be conducted at the APD stage of development to determine the presence or absence of Sprague's pipits. The Sprague's pipit lease notice, LN 14-15, is issued with those leases and would be applied if Sprague's pipits are found in the area. If Sprague's pipits are found, protective measures would be applied as conditions of approval to minimize impacts to Sprague's pipits and their habitat. In the event oil and gas development is proposed within Sprague's pipit habitat, at the APD stage BLM would conference with the USFWS pursuant to section 7(a)(4) of ESA, or if the Sprague's pipit has been listed as threatened or endangered, BLM would consult with the USFWS pursuant to section 7(a)(2).

4.3.9.1.2 Other Special Status Species

As noted, up to 51 wildlife species that BLM has designated as "sensitive" have the potential to occur within the parcel areas. Stipulations are not provided for all BLM sensitive species in the current RMPs. Stipulations are provided for 7 out of the 46 "non-TE&P" sensitive species. For those species afforded some protections through existing stipulations, impacts could be minimized, but not eliminated. Impacts to BLM sensitive species would be similar to those described above, unless they are afforded protective measures from other regulations such as the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703.) or the Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668c). The BLM does not consult with the USFWS on "sensitive" species and likewise would not receive terms and conditions from USFWS requiring additional protections of those species.

Numerous species of birds were identified as potential inhabitants across the analysis area. With the impacts associated with development, it is reasonable to assume there would be impacts to nesting and migrating bird species. The primary impacts to these species would include disturbance of preferred nesting habitats, improved habitat for undesirable competitors and/or a species shift to disturbance associated species, and increased vehicle collisions.

Research in Sublette County, Wyoming on the effects of natural gas development on sagebrush steppe passerines documented negative impacts to sagebrush obligates such as Brewer's sparrows, sage sparrows, and sage thrashers (Ingelfinger 2001). The impacts were reported greatest along roads where traffic volumes are high and within 100 meters of these roads. Sagebrush obligates were reduced within these areas by as much as 60%. Sagebrush obligate density was reduced by 50% within 100 meters of a road even when traffic volumes were less than 12 vehicles /day. It would be expected that similar population declines would occur to other native prairie species within the analysis area.

Stipulations do not exist specifically for the protection of BLM sensitive songbirds. The MBTA prohibits the take, capture or kill of any migratory bird, any part, nest or eggs of any such bird (16 U.S.C 703 (a)). NEPA analysis pursuant to Executive Order 13186 (January 2001) requires BLM to ensure that MBTA compliance and the effects of Bureau actions and agency plans on migratory birds are evaluated, should reduce take of migratory birds and contribute to their conservation.

Effects to migratory birds from oil and gas development at the APD stage could include direct loss of habitat from roads, well pads and other infrastructure, disturbance, powerline strikes and unintended direct mortality, fragmentation of habitat, change in use of habitats, and potential threats and competition from edge species. Field surveys for nesting birds at proposed development sites would be conducted for activities planned in between April 15 and July 15. Mitigation measures would be assigned at the APD stage to minimize negative effects on migratory bird populations, in compliance with Executive Order 13186 and MBTA. These mitigation measures would be required as COAs. An NSO stipulation for oil and gas surface disturbing activities in riparian and wetland areas would prohibit any potential oil and gas development in those habitats unless approval was granted through the Waivers, Exceptions, and Modifications (WEM) process. The BLM would coordinate WEMs with USFWS to assure MBTA compliance.

Take of bald and golden eagles and any other migratory raptors would not occur as a result of the act of leasing parcels. However, as development occurs after permits to drill are issued, there would be potential for take to occur as a result of raptor collisions with vehicles, power lines, and other development-related actions. Therefore, field surveys for raptors at proposed development sites would be conducted for activities planned between March 1 and August 1. To comply with MBTA and BGEPA, BLM would require protective measures and stipulations at the APD stage to prevent or minimize impacts to individual raptors and raptor populations, including bald and golden eagles. The protective measures would be required as COAs.

4.3.9.1.3 Other Fish and Wildlife

The types and extent of impacts to other wildlife species and habitats from development are similar to those described above for other species. Based on the RFD scenarios, direct habitat loss is possible. Initial disturbance could change the occupation of those areas to disturbance-oriented species (e.g., horned larks), or species with more tolerance for disturbances. These changes could also be expected to decrease the diversity of wildlife. Although bladed corridors would be reclaimed after the facilities are constructed, some changes in vegetation could occur along the reclaimed areas. The goal of reclamation is to restore disturbed areas to pre-disturbed conditions. The outcome of reclamation, unlike site restoration, will therefore not always mimic pre-disturbance conditions and offer the same habitat values to wildlife species. Sagebrush obligates, including some species of songbirds and sage grouse, could be most affected by this change.

It is anticipated that some development could occur adjacent to existing disturbances of some type. Depending on proximity and species tolerance, wildlife species within these areas could either have acclimated to the surrounding conditions, previously been displaced by construction activities, or could be caused to be displaced to other areas with or without preferred habitat.

Potential impacts to aquatic wildlife from development could include: overland oil spills, underground spills from activities associated with horizontal drilling or other practices, spills from drilling mud or other extraction and processing chemicals, and surface disturbance activities that create a localized erosion zone. Oil spills and other pollutants from the oil extraction process could harm the aquatic wildlife species in two different ways if the spill substances enter the habitat. First, toxicological impacts from direct contact could have immediate lethal effects to eggs, larvae, juveniles, and adults. Second, toxic effects to lower food web levels (e.g. aquatic macro-invertebrates) could indirectly affect fish, amphibian, and reptile species by degrading water quality and degrading or eliminating food resources.

Additional mitigation could occur as COAs at the APD stage. These conditions could include the placement of earthen berms and oil skimmers (in ephemeral drainages where fish passage will not be blocked) to help protect aquatic wildlife habitat in case of oil spills.

Oil and gas development is allowed within big game crucial winter range with a timing restriction from December 1 to March 31. This stipulation does not apply to operation and maintenance of production facilities. The goal of this stipulation is to protect crucial big game habitats from disturbance during the winter use season. This stipulation provides protection to big game winter habitats and species only during that timeframe, and does not provide protection during the long-term operation and maintenance periods. Development can occur outside of those dates and will exist thereafter until reclamation, thus only delaying impacts until after that year of construction.

Mule deer could be impacted by this project from habitat fragmentation and disturbance. Mule deer winter range habitat has been identified within 6 lease parcels. Development could affect mule deer use of winter range habitat in those areas. Studies conducted in the Pinedale anticline of Wyoming found that mule deer avoided areas in close proximity to well pads with no evidence of well-pad acclimation during 3 out of 4 years. During year 4 of development habitat selection patterns were influenced more by road density, and not proximity of well pads. The authors attributed this to an unusually severe winter, where movement options and available habitat was limited. Densities of mule deer decreased by an estimated 46% within the developed area over the four years, and indirect impacts were observed out to 2.7-3.7 km of well sites. Mule deer distribution shifted toward less preferred and presumably less suitable habitat. (Sawyer et al. 2005) Similar impacts could be expected from development with this proposal.

White-tailed deer could also be expected to be impacted by this project from habitat fragmentation and disturbance. Winter range for white-tailed deer exists across the analysis area, but covers much less area than other big game ranges. White-tailed deer winter range has been identified within 1 lease parcel.

Pronghorn could be impacted by this project from habitat fragmentation and disturbance. Pronghorn winter range habitat has been identified within 9 lease parcels. Preliminary studies in the upper green river basin in Wyoming report that some pronghorn exhibit movement patterns that suggest almost complete avoidance of gas field areas of intensive development in the Jonah field during the winter, whereas pronghorn in the Pinedale Anticline Project Area (PAPA) apparently have not been avoiding human activities. It is speculated that the difference may exist due to different levels in well densities, as the Jonah field was reported as 1 well/57 acres, and the PAPA at 1 well/124 acres (Berger et al. 2007). Effects to winter range within existing and future oil and gas development and exploration would be similar to those referenced above and could depend on rate and location of development.

Sharp-tailed grouse dancing grounds exist on 2 proposed lease parcels, and ¼ mile NSO buffers are applied to these parcels. In addition, all or portions of 10 lease parcels are located within 2 miles of sharp-tailed grouse leks where timing stipulations from March 1 to June 15 were applied. This timing does not apply to operation and maintenance of production facilities. Recent inventories for sharp-tailed grouse dancing grounds have not been conducted within some of the parcels. Therefore, inventories would be conducted at the APD stage of development to determine the presence or absence of sharp-tailed grouse dancing grounds. Although limited research exists that documents impacts to sharp-tailed grouse from development activities, it is expected that sharp-tailed grouse could be impacted by this project from habitat fragmentation and disturbance. Vehicles and human activity during breeding and nesting seasons could reduce breeding activity, displace nesting hens and reduce the suitability of habitat for brood-rearing. Mortality could increase as a result of collisions with vehicles.

Wild turkeys, pheasants, and Hungarian partridge could also be affected by disturbance and direct mortality through nest destruction and vehicle collisions during the development stages.

4.3.9.2 Mitigation

Measures would be taken to prevent, minimize, or mitigate impacts to fish and wildlife animal species from exploration and development activities. Prior to authorization, activities would be evaluated on a case-by-case basis, and the project would be subject to mitigation measures. Mitigation could include rapid revegetation, project relocation, or pre-disturbance wildlife species surveying. If oil and gas development is proposed in suitable habitat for threatened or endangered species, consultation with the USFWS would occur to determine if additional terms and conditions would need to be applied.

4.3.10 Cultural Resources

4.3.10.1 Direct and Indirect Effects

Leasing the parcels would have no direct impacts on cultural resources. Any potential effects from the sale of leases would occur at the time the leases are developed.

Potential effects from surface disturbance associated with exploration and development activities have the potential to alter the characteristics of a significant cultural or historic property by diminishing the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Other effects to cultural resources from proposed surface disturbance activities include the destruction, damage, or alteration to all or part of the cultural resource and diminishing the property’s significant historic features as a result of the introduction of visual, atmospheric, or audible elements. Cultural resource investigations associated with development potentially adds to our understanding of the prehistory/history of the area and discovery of sites that would otherwise remain undiscovered due to burial or omission. Indirect effects to cultural resources within the analysis area by county are as follows:

The following lease parcels have sites within their boundaries: MTM 105431-H9- within Roosevelt County.

One lease parcel (MTM 105431-HA) is located in McCone County consisting of 40.0 acres. Based on modeling, the parcel might contain less than one cultural site (.43 sites) of which less than one could have the potential to be eligible or considered eligible for listing on the National Register of Historic Places.

Ten lease parcels (MTM 105431-HC, HD, HE, HG, HH, HJ, HF, HK, HL and HM) are located in Powder River County consisting of 4,597 acres (4596.87 acres). Based on modeling, the parcels might contain up to 49.4 cultural sites of which 5 to 8 could have the potential to be eligible or considered eligible for listing on the National Register of Historic Places.

Two lease parcels (MTM 102757-WT and WW) are located in Prairie County consisting of 1,919 acres (1,919.24 acres). Based on modeling, the parcels might contain up to 20.6 cultural sites of which two to three could have the potential to be eligible or considered eligible for listing on the National Register of Historic Places.

Three lease parcels (MTM 105431-HB, H6 and H8) are located in Richland County consisting of 1,189 acres (1,189.21 acres). Based on modeling, the parcels might contain up to 13 cultural sites (12.7) of which one to two could have the potential to be eligible or considered eligible for listing on the National Register of Historic Places.

Two lease parcels (MTM 105431-H9 and JA) are located in Roosevelt County consisting of 200acres (199.96 acres). Based on modeling, the parcels might contain 2 cultural sites of which less than one could have potential to be eligible or considered eligible for listing on the National Register of Historic Places.

Leasing approximately 7,945 acres of Federal minerals within the five counties described above could indirectly affect 85.4 cultural sites based upon modeling (Aaberg et al 2006). Of the modeled 85 cultural sites, 8 to 13 sites may have the potential to be eligible or considered eligible for listing on the National Register of Historic Places.

The Reasonable Foreseeable Development (RFD and Appendix D) scenario for the lease parcels predicts 7 wells and 29.4 acres of disturbance as a result from leasing the parcels which may affect 1 site which may have the potential to be eligible for listing on the National Register of Historic Places.

4.3.10.2 Mitigation

Application of standard lease terms, stipulations, and cultural lease notices provide mechanisms to protect vulnerable significant cultural resource values on these lease parcels (Appendix A). Lease notice LN 14-2 would be applied to 1 lease parcel (MTM 105431-H9). Lease notice LN 14-14 would be applied to 3 lease parcels (MTM 105431-H8, H9 and HB). The cultural resource lease stipulation CR16-1 would be applied to all the lease parcels. The inclusion of these requirements at the leasing stage provide notification to the lessee that potentially valuable cultural resources are or are likely to be present on the lease parcels and potential mitigation measures may be required. The application and implementation of these stipulations and lease notices at the development stage would provide the necessary measures to protect cultural resources.

Specific mitigation measures, include but are not limited to, site avoidance, excavation or data recovery would have to be determined when site-specific development proposals are received. Most surface-disturbing situations for cultural resources would be avoided by project redesign or relocation. Unavoidable, significant properties would be site-specifically mitigated with concurrence with the State Historic Preservation Office prior to implementation of a project.

4.3.11 Native American Religious Concerns

4.3.11.1 Direct and Indirect Effects

Leasing the parcels would have no direct impacts on Native American religious concerns. Any potential effects from the sale of leases could occur at the time the leases are developed.

Leasing parcels located near the Fort Peck Reservation in Richland and Roosevelt Counties and Turtle Mountain Public Domain Allotments in Roosevelt County would not interfere with the performance of traditional ceremonies and rituals pursuant to the American Indian Religious Freedom Act (AIRFA) or EO 13007. Leasing parcels in this area would not prevent tribes from visiting sacred sites or prevent possession of sacred objects.

4.3.11.2 Mitigation

Mitigation would be the same as section 4.3.10.2 above. For those parcels where no inventory data is available or where no information is available for TCPs, BLM would apply the cultural lease notice (CR 16-1). The sites in parcel MTM 105431-H9 would be revisited and reevaluated for National Register eligibility prior to any surface disturbance.

4.3.12 Paleontology

4.3.12.1 Direct and Indirect Effects

Leasing the parcels would have no direct impacts on paleontological resources. Any potential effects from the sale of leases could occur at the time the leases are developed.

Indirect impacts from the sale of leases would be from the surface disturbances associated with oil and gas exploration and development activities. It is anticipated that most significant fossil resources are located in those geologic units with a Potential Fossil Yield Classification (PFYC) of 3 or higher. However, significant fossil resources could be discovered anywhere. Surface-disturbing activities could potentially alter the characteristics of paleontological resources through damage, fossil destruction, or disturbance of the stratigraphic context in which paleontological resources are located, resulting in the loss of important scientific data. Identified paleontological resources could be avoided by project redesign or relocation before project approval which would negate the need for the implementation of mitigation measures. Conversely, surface-disturbing activities could potentially lead to the discovery of paleontological localities that would otherwise remain undiscovered due to burial or omission during review inventories. The scientific retrieval and study of these newly discovered resources would expand our understanding of past life and environments of Montana.

4.3.12.2 Mitigation

The application of lease terms, the paleontological no surface occupancy stipulation (NSO 11-12), and the paleontological lease notices (LN 14-3 and LN 14-12) at leasing, provides protection to paleontological resources during development. The paleontological lease notice LN 14-12 is applied to those lease parcels that fall within geological units with a PFYC Class of 3 or higher, usually requiring a field survey prior to surface disturbance. These inventory requirements could result in the identification of paleontological resources. Avoidance of significant paleontological resources or implementation of mitigation prior to surface disturbance would protect paleontological resources. However, the application of lease terms only allows the relocation of activities up to 200 meters, unless documented in the NEPA document, and cannot result in moving the activity off lease.

Specific mitigation measures could include, but are not limited to, site avoidance or excavation. Avoidance of paleontological properties would be a best management practice. However, should a paleontological locality be unavoidable, significant fossil resources must be mitigated prior to implementation of a project. Also, significant fossil resources could be discovered in areas that had not been evaluated (PFYC of less than 3) during surface disturbance. Those resources must also be professionally mitigated. These mitigation measures and contingencies would be determined when site specific development proposals are received.

In order to protect paleontological resources, 18 of the parcels are recommended to have the Paleontological lease notice 14-12 applied per guidance identified in IM 2009-011 and 2008-009. No parcels are recommended for the no surface occupancy lease stipulation (NSO 11-12) based upon paleontological resources. See section 3.10 Paleontology for list of parcels.

4.3.13 Visual Resources

4.3.13.1 Direct and Indirect Effects

Leasing the parcels would have no direct impacts on visual resources. Any potential effects from the sale of leases could occur at the time the leases are developed.

The lease parcels fall into VRM classes II, III and IV, as demonstrated in Section 3.11, Visual Resources, Table 7. While the act of leasing federal minerals produces no visual impacts, development of a lease parcel could result in some level of modification to the existing landscape at the time of development.

4.3.13.2 Mitigation

All new oil and gas development would implement, as appropriate for the site, BLM BMPs for VRM, regardless of the VRM class. This includes, but would not be limited to, proper site selection, reduction of visibility, minimizing disturbance, selecting color(s)/color schemes that blend with the background and reclaiming areas that are not in active use. Repetition of form, line, color and texture when designing projects would reduce contrasts between landscape and development. Wherever practical, no new development would be allowed on ridges or mountain tops. Overall, the goal would be to not reduce the visual qualities or scenic value that currently exists.

There are no lease parcels that fall within a VRM Class II management objective. Measures would be taken to mitigate the visual impacts within a Class III and Class IV area to protect the scenic value.

4.3.14 Forest and Woodland Resources
4.3.14.1 Direct and Indirect Effects
Potential impacts from oil and gas development could include the cutting and subsequent removal of forest and woodland vegetation from drill-site development areas; including roads, pads, surface facilities, pipelines, and power-lines. The degree of impact would vary according to the precise location of development activities in the parcel area and is directly related to topography, miles of road construction, standing timber volume per acre, and total acres of surface facilities development. A total of approximately 2,116 forest and woodland acres could potentially be impacted under this alternative; 1,671 acres of evergreen, 361 acres of deciduous, and 84 acres of mixed evergreen-deciduous forest.

4.3.14.2 Mitigation
Measures would be taken to prevent, minimize, or mitigate impacts to forest and woodland resources from exploration and development activities. Prior to authorization, activities would be evaluated on a case-by-case basis, and the project would be subject to mitigation measures. The road construction and maintenance BMPs outlined in the Gold Book are consistent with the Water Quality BMPs for Montana Forests (Logan 2001) which are designed to protect water quality and forest soils. Other mitigation measures could include the artificial planting of bareroot or containerized nursery stock seedlings.

All severed forest and woodland vegetative material would need to be removed or reduced to acceptable standards meeting Montana's Control of Timber Slash and Debris Law (Title 76, Chapter 13, Part 4), commonly referred to as the "Slash" Law; therefore, requiring burning, grinding, chipping, burying, or hauling residual debris off-site to a designated landfill or other location for disposal.

4.3.15 Livestock Grazing
4.3.15.1 Direct and Indirect Effects
Leasing the parcels would have no direct impacts on livestock grazing. Any potential effects from the sale of leases would occur at the time the leases are developed.

Oil and gas development could result in a loss of vegetation for livestock grazing (e.g., direct removal, introduction of unpalatable plant species, etc.), decrease the palatability of vegetation due to fugitive dust, disrupt livestock management practices, involve vehicle collisions, and decrease grazing capacity. Direct losses of forage could also result from construction of roads, well pads and associated infrastructure and would vary depending on the extent of development. These impacts could vary from short-term impacts to long-term impacts depending on the type of exploration or development, the success of reclamation, and the type of vegetation removed for the oil and gas activities.

If development activity is reducing vegetative resources for livestock grazing and the grazing activity is resulting in the allotment not meeting the standards for rangeland health, then the authorized officer would have to take action prior to the next grazing season to ensure the BLM lands are progressing towards meeting the standards. This could result in the change of livestock grazing activities in order to improve vegetative conditions.

4.3.15.2 Mitigation

Measures would be taken to prevent, minimize, or mitigate impacts to livestock grazing from exploration and development activities. Prior to authorization, activities would be evaluated on a case-by-case basis, and the project would be subject to mitigation measures. Mitigation could potentially include controlling livestock movement by maintaining fence line integrity, fencing of facilities, re-vegetation of disturbed sites, and fugitive dust control.

4.3.16 Recreation and Travel Management

4.3.16.1 Direct and Indirect Effects

Leasing the parcels would have no direct impacts on recreation and travel management. Any potential effects from the sale of leases could occur at the time the leases are developed.

Recreation indirect effects could exist where oil and gas development and recreational user conflicts could occur. More specifically, in areas of high oil and gas development potential, there could be user conflicts between motorized recreationists (OHV activities), hunting, target shooting, camping, fishing, river use, picnicking, and winter activities (e.g., snowmobiling) and associated oil and gas activities. These impacts could exist in both the short-term (exploration and construction phases of oil and gas development) and in the long-term (producing wells, maintenance of facilities, etc.). Oil and gas wells, equipment, and facilities could affect the general solitude (space and noise) and scenic value of the area.

Areas frequented by recreationists, where there is other land use activities occurring, in addition to oil and gas development, the public could perceive these areas as inaccessible or unavailable because of the existing facilities. As oil and gas development occurs, new routes are created which often attract recreationists seeking additional or new areas to explore for motorized recreational opportunities. Motorized recreational opportunities could be enhanced through the additional opportunities to explore; however, user conflicts and public safety issues could result from the use of the new travel routes. The creation of routes from oil and gas activities could lead to a proliferation of user-created motorized routes, resulting in adverse impacts to the scenic qualities of the area and increased level of surface disturbance.

For those areas with isolated tracks of BLM public lands that generally do not have existing public access, recreation opportunities that occur in these areas are limited to use with adjacent land owner permission or hunting by an outfitter; therefore, oil and gas activities would have little or no impact on recreational experiences in these isolated tracks.

Foreseeable changes in recreation use levels would be an increase on the demand for recreational use of public land. Increases could be expected in, but not limited to, hunting, fishing, hiking, camping, wildlife viewing, and dispersed recreational uses. This could increase the incidence of conflict between recreationists involved in motorized activities and non-motorized activities.

4.3.16.2 Mitigation

Additional measures would be taken to minimize, avoid, or mitigate impacts to recreation from oil and gas exploration and development activities. Prior to authorization, activities would be evaluated on a case-by-case basis, and the project would be subject to mitigation measures. Mitigation measures could potentially include, but are not limited to, reclamation of industrial routes/areas when no longer needed, fencing of facilities, and installing signs along roads.

4.3.17 Lands and Realty

4.3.17.1 Direct and Indirect Effects

Leasing the parcels would have no direct impacts on lands and realty. Any potential effects from the sale of leases could occur at the time the leases are developed.

Under this alternative 18 parcels that include 7,945.28 surveyed surface acres of which 3,637.97 surveyed acres are BLM administered surface and 4,307.31 surveyed acres are Non-Federal surface would be offered for lease.

Facilities associated with oil and gas development could cause disturbance to the existing rights-of-way (ROWs). There are four existing ROWs located on the following three lease parcels; MTM-102757-WT, MTM-105431-HB and MTM-105431-H8. A ROW for a county road (MTM-99365) on MTM-102757-WT, a ROW for an overhead power line (MTM-55529) on MTM-105431-H6, and a ROW for an oil and gas road (MTM-103251) and oil pipeline (MTM-103965) on MTM-105431-H8. Additional ROWs could be required across Federal surface for "off-lease" or third party facilities required for potential development of the parcels.

4.3.17.2 Mitigation

Measures would be taken to avoid disturbance to or impacts to existing rights-of-way, in the event of any oil and gas exploration and development activities. Any new "off-lease" or third party rights-of-way required across federal surface for exploration and/or development of the 18 parcels would be subject to lands and realty stipulations to protect other resources as determined by environmental analyses. In order to protect the existing rights-of-way it is recommended that LN 14-1 be applied to lease parcels MTM-102757-WT, MTM-105431-HB and MTM-105431-H8.

4.3.18 Minerals

4.3.18.1 Fluid Minerals

4.3.18.1.1 Direct and Indirect Effects

Leasing the parcels would have no direct impacts on fluid minerals. Any potential effects from the sale of leases could occur at the time the leases are developed.

Issuing a lease provides opportunities to explore for and develop oil and gas resources; however, exploration and development activities must be conducted in accordance with an approved APD. Additional natural gas or crude oil produced from any or all of the 18 parcels in Alternative B would enter the public markets. Additional subsurface information would be obtained from drilling wells. Royalties and taxes could accrue to the Federal and State treasuries from the lease parcel lands.

Under Alternative B, all of the lease parcels would be offered for lease subject to major (NSO) or moderate (CSU) constraints and/or standard lease terms and conditions.

Stipulations applied to various areas with respect to occupancy, timing limitation, and control of surface use could affect oil and gas exploration and development, both on and off the Federal lease parcel. Leases issued with major constraints (NSO stipulations) could decrease some lease values, increase operating costs, and require relocation of well sites, and modification of field development. Leases issued with moderate constraints (timing limitation and controlled surface Use (CSU) stipulations) could result in similar but reduced impacts, and delays in operations and uncertainty, on the part of operators, regarding restrictions.

Hydraulic Fracturing

Hydraulic fracturing has been utilized by the oil and gas industry since the late 1940's. Within the planning area, hydraulic fracturing, in conjunction with horizontal drilling described above, has allowed for development of unconventional zones that were once considered uneconomical, like the Bakken and Three Forks Formations in the Williston Basin area.

Hydraulic fracturing is a technique used to create additional space and connecting existing fractures and existing rock pores with newly created fractures that are located in deep underground geologic formations. The induced space allows the rock to more readily release oil and natural gas so it can flow to the surface via the well bore that would otherwise be uneconomical to develop. Wells that undergo hydraulic fracturing may be drilled vertically, horizontally, or directionally and the resultant fractures induced by the hydraulic fracturing can be vertical, horizontal, or both. The typical steps of hydraulic fracturing can be described as follows:

1. Water, sand and additives are pumped at high pressures down the wellbore.
2. The liquid goes through perforated sections of the wellbore and into the surrounding formation, fracturing the rock and injecting sand or other proppants into the cracks to hold them open.
3. Experts continuously monitor and gauge pressures along with the volume of fluids and proppants, while studying how the sand reacts when it hits the bottom of the wellbore; slowly increasing the density of sand to water as the frac progresses.
4. This process may be repeated multiple times, in "stages" to reach maximum areas of the wellbore. When this is done, the wellbore is temporarily plugged between each stage to maintain the highest water pressure possible and get maximum fracturing results in the rock.
5. Frac plugs are drilled or removed from the wellbore and the well is tested for results.
6. The water pressure is reduced and fluids are returned up the wellbore for disposal or treatment and re-use, leaving the sand in place to prop open the cracks and allow the oil/gas to flow to the well bore.

Fracturing fluid is typically more than 98 percent water and sand, with small amounts of readily available chemical additives used to carry the proppant and control the chemical and mechanical properties of the water and sand mixture. Proppant, consisting of synthetic or natural silica sand, may be used in quantities of few hundred tons for a vertical well to a few thousand tons for a horizontal well. The amount of water needed to fracture a well in the planning area depends on the geologic basin, the formation, and depth and type of well (vertical, horizontal, directional), and the proposed completion process.

Several sources of water are available for hydraulic fracturing in the planning area. The Fluid Minerals Operations and Procedures Appendix contain further details on sources of water that could potentially be used for hydraulic fracturing or drilling operations. The use of any specific water source on a federally administered well, requires the proposal be reviewed and analyzed through the NEPA process for BLM approval during the APD stage to ensure compliance with Montana water laws and federal regulations.

Before hydraulic fracturing takes place, all surface casing and some deeper, intermediate zones are required to be cemented from the bottom of the cased hole to the surface in accordance to Onshore Order #2, MBOGC rules and regulations, and API standards. The cemented well is pressure tested to ensure there are no leaks and a cement bond log is run to ensure the cement has bonded to the casing and the formation.

MBOGC regulations also ensure that all resources including groundwater are protected. The MBOGC regulations require new and existing wells, which will be stimulated by hydraulic fracturing, must demonstrate suitable and safe mechanical configuration for the stimulation treatment proposed. If the operator proposes hydraulic fracturing through production casing or through intermediate casing, the casing must be tested to the maximum anticipated treating pressure. In accordance with MBOGC Rule 36.22.1015 operators are required to disclose and report the amount and type of fluids used in well stimulation to the Board or, if approved by the Board, to the Interstate Oil and Gas Compact Commission/Groundwater Protection Council hydraulic fracturing web site (FracFocus.org).

4.3.19 Special Designations

4.3.19.1 National Historic/Scenic Trails

There are no lease parcels located within the Lewis and Clark National Historic Scenic Trail or the Lewis and Clark Special Recreation Management Area (SRMA). However, two Lease parcels, MTM 105431-H8 and HB (947.3 acres), are located within a 3 mile sensitive Setting Consideration Zone (SCZ) around the Lewis and Clark National Historic Trail (NHT) and SRMA.

Potential effects from surface disturbances associated with exploration and development activities after leasing have the potential to alter the characteristics of the significant Lewis and Clark National Historic Trail, a cultural and historic property, by diminishing the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. The effects to the Lewis and Clark National Historic Trail cultural resource from proposed surface disturbance activities include the destruction, damage, or alteration to all or part of the cultural resource and diminishing significant historic features of the property by the introduction of visual, atmospheric, or audible elements. This could alter or diminish the elements of this nationally significant site diminish the property’s significance. These same concerns apply to a National Register eligible property and would diminish the property’s eligibility status. Cultural resource investigations associated with development potentially adds to our understanding of the prehistory/history of the area and discovery of sites that would otherwise remain undiscovered due to burial or omission.

4.3.19.2 Areas of Critical Environmental Concern (ACECs)

None of the 18 parcels are situated within a proposed or designated Area of Critical Environmental Concern (ACEC). There will be no affect to ACEC's through the proposed alternative.

4.3.19.3 Mitigation

Two Lease parcels, MTM 105431-H8 and HB, are located near the Lewis and Clark NHT. These parcels are on split-estate lands outside of the Lewis and Clark NHT, greater than ½ mile from the Trail centerline, and within the three mile potential viewshed of the river and Lewis and Clark NHT. For these parcels, BLM would apply its Best Management Practices similarly to those that pertain to Cultural Resource management.

Since the Lewis and Clark NHT is a congressionally designated component of the NHT system, BLM would apply the same kind of analysis that is applied to determining an effect to a property eligible for the National Register of Historic Places. That process includes determining whether an undertaking would have an adverse effect on the historic nature of the Lewis and Clark NHT by altering, directly or indirectly, any of the characteristics of the historic nature of the Lewis and Clark NHT in a manner that would diminish the integrity of the Trail's location, setting, feeling, or association. Adverse effects may include reasonably foreseeable effects caused by an undertaking that may occur later in time, be farther removed in distance or be cumulative.

Examples of adverse effects on the historic nature of the Lewis and Clark NHT include, but are not limited to change of the character of the Trail's historic nature or physical features within Trail's corridor setting that contribute to diminishing the Trail's historic significance; and the introduction of visual, atmospheric or audible elements that diminish the integrity of the Trail's historic significance. If it is determined that an undertaking within the viewshed of the Lewis and Clark NHT would have an adverse effect on the historic character of the Trail where the integrity of the setting is a contributing element of the historic character of the Trail, then surface occupancy or use and surface disturbance would be restricted.

Prior to surface disturbance, occupancy or use a mitigation plan (Plan) would need to be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator may not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan or approved it with conditions. The Plan would need to demonstrate to the authorized officer's satisfaction that the infrastructure will either not be visible or will result in a weak contrast rating and would not have an adverse effect on the setting of the historic character of the Lewis and Clark NHT.

4.3.20 Social and Economic Conditions
4.3.20.1 Social
4.3.20.1.1 Direct and Indirect Effects
Leasing the parcels would have no direct impacts on social resources. Any potential effects from the sale of leases could occur at the time the leases are developed.

While the act of leasing Federal minerals itself would result in no social impact, subsequent exploration and development may generate impacts to people living near or using the area in the vicinity of the lease. Exploration, drilling or production could create an inconvenience to people living adjacent to leases due to increased traffic and traffic delays, and light, noise and visual impacts. This could be especially noticeable in rural areas where oil and gas development has not occurred previously. The amount of inconvenience would depend of the activity affected, traffic patterns within the area, noise and light levels, length of time and season these activities occur, etc. In addition, competition for housing could occur in some communities. However, residents living in areas that have been experiencing ongoing population losses may support the increased employment and population related to oil and gas development. Residents of counties where the development actually occurs would also benefit from the additional revenues to counties due to oil and gas leasing and development.

There is potential for disproportionate effects to low income or minority populations, specifically American Indian populations. Consultation with potentially affected Tribes would occur at the APD stage.

4.3.20.2 Economics
4.3.20.2.1 Direct and Indirect Effects
Under Alternative B, 18 parcels in counties would be made available for leasing at the October 2014 lease auction. The leasing of an additional 7,945 acres of BLM administered minerals in these counties would generate additional public revenue, stimulate economic activity, and boost production associated with Federal minerals. It is estimated that the leasing of all minerals nominated for the October auction would generate more than $756,000 in one-time bonus bids and $14,000 annually in rent revenue for the Federal government. Forty-nine percent of Federal revenue collected from public domain minerals and 25 percent of Federal revenue from acquired minerals (acquired under Bankhead Jones authority) are redistributed to the State. Montana then distributes 25 percent of public domain revenue and all of acquired mineral revenue back to the counties where the leases exist. Approximately 94 percent of federal minerals leased by the BLM within McCone, Powder River, Prairie, Richland and Roosevelt counties are public domain minerals. If these additional parcels were to be leased, an additional $43,000 would be paid to the State of Montana and the five counties would receive an additional $12,000 from the redistribution of federal revenue.

Once oil and gas extraction begins, annual rent payments on leased minerals stops and lessees begin to pay royalties equal to 12.5 percent of the value of production (43 CFR 3103.3.1). Royalties associated with future development of nominated minerals is estimated to generate an additional $206,000 annually in federal oil and gas royalties. Of this new federal revenue, an estimated $98,000 could be disbursed to the State and $27,000 is estimated to be redistributed back to the five counties.

In addition to generating additional public revenue, leasing an additional 7,945 acres of federal minerals in McCone, Powder River, Prairie, Richland and Roosevelt counties will stimulate economic activity in the private sector of the local 8-county economy. Increased local demand for oil and gas drilling and support activities will create a ripple effect in the local economy as new employment and income opportunities in oil and gas related industries indirectly creates opportunities in nearly all other sectors of the local economy.

The total economic impact of leasing activities proposed under Alternative B is equal to direct and indirect effects of drilling activities, as well as the direct and indirect effects of additional public revenue redistributed back to the five counties. As shown in Table 14, the bonus bids, rents, royalties, and drilling and support activities associated with leasing an additional 7,945 acres of federal minerals is estimated to support 2 additional jobs and $61,000 in labor income across the 8-county local economy (IMPLAN, 2014).

Disclosure of the direct, indirect, and cumulative effects of GHG emissions provides information on the potential economic effects of climate change including effects that could be termed the "social cost of carbon" (SCC). The EPA and other federal agencies developed a method for estimating the SCC and a range of estimated values (EPA 2014). The SCC estimates damages associated with climate change impacts to net agricultural productivity, human health, property damage, and ecosystems. Using a 3 percent average discount rate and year 2020 values, the incremental SCC is estimated to be $46 per metric ton of annual CO_2e increase. Based on the GHG emission estimate provided in Section 4.3.3.1.2, the annual SCC associated with potential development on lease sale parcels is $38,499 (in 2011 dollars). Estimated SCC is not directly comparable to economic contributions reported above, which recognize certain economic contributions to the local area and governmental agencies but do not include all contributions to private entities at the regional and national scale. Direct comparison of SCC to the economic contributions reported above is also not appropriate because costs associated with climate change are borne by many different entities.

4.3.21 Cumulative Impacts- Alternative B

Cumulative impacts are those impacts resulting from the incremental impact of an action when added to other past, present, and reasonably foreseeable actions regardless of what agency or person undertakes such other actions (40 CFR 1508.7). This section describes cumulative impacts associated with this project on resources. The ability to assess the potential cumulative impacts at the leasing stage for this project is limited for many resources due to the lack of site-specific information for potential future activities. Upon receipt of an APD for any of the lease parcels addressed in this document, more site-specific planning would be conducted in which the ability to assess contributions to cumulative impacts in a more detailed manner would be greater due to the availability of more refined site-specific information about proposed activities.

4.3.21.1 Past, Present and Reasonably Foreseeable Future Actions

Past, present, or reasonably foreseeable future actions that affect the same components of the environment as the Proposed Action, if developed, are: grazing, roads, wildfire and prescribed fire, range improvement projects, and utility rights-of-way.

4.3.21.2 Cumulative Impacts by Resource

Cumulative effects for all resources in the MCFO are described in the final Big Dry RMP/EIS (pgs. 111 to 156) and the 1992 Oil and Gas Amendment of the Billings, Powder River, and South Dakota Resource Management Plans and Final Environmental Impact Statement and the 1994 Record of Decision and the 2008 Final Supplement to the Montana Statewide Oil and Gas Environmental Impact with a development alternative for coal bed natural gas production (4-1 to 4-310). Anticipated exploration and development activities associated with the lease parcels considered in this EA are within the range of assumptions used and effects described in this cumulative effects analysis for resources other than air, climate, and socio-economics resources. This previous analysis is hereby incorporated by reference for resources other than for air, climate, and economics resources.

4.3.21.2.1 Greenhouse Gas Emissions and Cumulative Impacts on Climate Change

The cumulative effects analysis area is the MCFO, with additional discussion at state-wide, national, and global scales for GHG emissions and climate change.

This section incorporates an analysis of the contributions of the Proposed Action to GHG emissions, followed by a general discussion of potential impacts to climate change. Potential emissions relate to those derived from potential exploration and development of fluid minerals. Additional emissions beyond the control of the BLM, and outside the scope of this analysis, would also occur during any needed refining processes, as well as end uses of final products.

Projected GHG emissions for this project and the MCFO RFD are compared below with recent, available inventory data at the State, national, and global scales. GHG emissions inventories can vary greatly in their scope and comprehensiveness. State, national, and global inventories are not necessarily consistent in their methods or in the variety of GHG sources that are inventoried (Climate Change SIR 2010). However, comparisons of emissions projected by the BLM for its oil and gas production activities are made with those from inventories at other scales for the sake of providing context for the potential contributions of GHGs associated with this project.

As discussed in the Air Quality section of Chapter 4, total projected BLM GHG emissions from the RFD are 610,741.1 metric tons/year CO_2e. Potential emissions under Alternative B would be approximately 0.041 percent of this total. Table 15 displays projected GHG emissions from non-BLM activities included in the Miles City RFD. Total projected emissions of non-BLM activities in the RFD in Appendix B are 1,382,890 metric tons/year of CO_2e. When combined with projected annual BLM emissions, this totals 1,383,139 metric tons/year CO_2e. Potential GHG emissions under Alternative B would be 0.042 percent of the estimated emissions for the entire RFD. Potential incremental emissions of GHGs from exploration and development of fluid minerals on parcels within Alternative B, and Alternative C, would be minor in the context of projected GHG contributions from the entire RFD for the MCFO.

Table 19. Projected non-BLM GHG Emissions Associated With the MCFO Reasonably Foreseeable Development Scenario for Fluid Mineral Exploration and Development.

Source	Non-BLM Long-Term GHG Emissions in tons/year				Emissions (metric tons/yr)
	CO_2	**CH_4**	**N_2O**	**Co_2e**	**CO_2e**
Conventional	545,689.1	5425.9	2.1	658,344.3	599,170.7

Natural Gas					
Coal Bed Natural Gas	274,925.2	5,330.5	0.9	387,135.7	351,302.8
Oil	422,033.9	2,576.2	1.2	476,522.7	432,416.3
Total	**1,242,648.3**	**13,332.6**	**4.2**	**1,522,002.7**	**1,382,889.8**

Montana's Contribution to U.S. and Global GHGs
Montana's GHG inventory (http://www.eia.doe.gov/oiaf/1605/archive/gg04rpt/emission.html, Center for Climate Strategies [CCS] 2007) shows that activities within the State contribute 0.6 percent of U.S and 0.076 percent of global GHG emissions (based on 2004 global GHG emission data from the IPCC, summarized in the Climate Change SIR 2010). Based on 2005 data in the state-wide inventory, the largest source of Montana's emissions is fossil fuel combustion to generate electricity, which accounts for approximately 27 percent of Montana's emissions. The next largest contributors are the agriculture and transportation sectors (each at approximately 22 percent) and fossil fuel production (13.6 percent).

GHG emissions from all major sectors in Montana in 2005 added up to a total of approximately 37 million metric tons of CO_2e (CCS 2007). Potential emissions from development of BLM lease parcels included in Alternative B would represent approximately 0.002 percent of the state-wide total of GHG emissions based on the 2005 state-wide inventory (CCS 2007).

The EPA published an inventory of U.S. GHG emissions, indicating gross U.S. emissions of 6,702 million metric tons, and net emissions of 5,797 million metric tons (when CO_2 sinks were considered) of CO_2e in 2011 (EPA 2013a). Potential annual emissions under Alternative B of this project would amount to approximately 0.000012 percent of gross U.S. total emissions. Global GHG emissions for 2004 (IPCC 2007, summarized by the Climate Change SIR 2010) indicated approximately 49 gigatonnes (10^9 metric tons) of CO_2e emitted. Potential annual emissions under Alternative B would amount to approximately 0.000002 percent of this global total.

As indicated above, although the effects of GHG emissions in the global aggregate are well-documented, it is currently not possible to determine what specific effect GHG emissions resulting from a particular activity might have on climate or the environment. If exploration and development occur on the lease parcels considered under Alternative B, potential GHG emissions described above could incrementally contribute to the total volume of GHGs emitted to the atmosphere, and ultimately to climate change.

Mitigation measures identified in the Chapter 4 Air Quality section above may be in place at the APD stage to reduce GHG emissions from potential oil and gas development on lease parcels under Alternative B. This is likely because many operators working in Montana, South Dakota, and North Dakota are currently USEPA Natural Gas STAR Program Partners and future regulations may require GHG emission controls for a variety of industries, including the oil and gas industry (Climate Change SIR 2010).

4.3.21.2.2 Cumulative Impacts of Climate Change
As previously discussed in the Air Quality section of Chapter 4, it is impossible to identify specific impacts of climate change on specific resources within the analysis area. As

summarized in the Climate Change SIR (2010), climate change impacts can be predicted with much more certainty over global or continental scales. Existing models have difficulty reliably simulating and attributing observed temperature changes at small scales. On smaller scales, natural climate variability is relatively larger, making it harder to distinguish changes expected due to external forcings (such as contributions from local activities to GHGs). Uncertainties in local forcings and feedbacks also make it difficult to estimate the contribution of GHG increases to observed small-scale temperature changes (IPCC 2007, as cited by the Climate Change SIR 2010). Effects of climate change on resources are described in Chapter 3 of this EA and in the Climate Change SIR (2010).

4.3.21.3 Cumulative Impacts to Wildlife

For wildlife species, past and presently on-going oil and gas development, fire, farming, livestock grazing, traffic, and any other form of human and natural disturbances result in cumulative impacts to wildlife. These impacts would not occur at the lease sale stage.

Construction of roads, production well pads, and other facilities would result in long term (>5 years) loss of habitat and forage in the analysis area. This would be in addition to acres disturbed, or habitats fragmented from various other adjacent activities. As new development occurs, direct and indirect impacts could continue to stress wildlife populations, most likely displacing the larger, mobile animals into adjacent habitat, and increasing competition with existing local populations. Non-mobile animals could be affected by increased habitat fragmentation and interruptions to preferred habitats.

Certain species are localized to some areas and rely on very key habitats during critical times of the year. Disturbance or human activities that could occur in winter range for big game, nesting and brood-rearing habitat for grouse and raptors could displace some or all of the species using a particular area or disrupt the normal life cycles of species. Wildlife and habitat in and around the project could be influenced to different degrees by various human activities. Some species and/or a few individuals from a species group could be able to adapt to these human influences over time.

4.3.21.4 Cumulative Impacts to Economic Conditions

The cumulative effects of Alternative B are summarized in Table 15 and Table 16. The leasing of an additional 7,945 acres of Federal minerals by the MCFO would result in a total of 442,811 acres leased from the MCFO within McCone, Powder River, Prairie, Richland and Roosevelt counties. The leasing of Federal minerals in these counties by the BLM would generate about $1 million in Federal revenue. The redistribution of Federal revenue associated with leasing of these Federal minerals is estimated to generate nearly $500,000 in State revenue for Montana and $124,000 in local public revenue in the five counties. Federal oil and gas production associated with BLM minerals in these counties is also anticipated to increase as a result of leasing under Alternative B. Royalties associated with BLM minerals in these counties are estimated to generate $11.5 million in Federal revenue. The redistribution of Federal royalty payments resulting from extraction of BLM minerals in the five counties would provide the State of Montana with $5.5 million in public revenue while $1.5 million would be distributed directly back to these producing counties.

Oil and gas related activities associated with Federal minerals leased from the MCFO generates millions in public revenue, stimulates economic activity in the public and private sectors, and can be attributed with supporting employment and income opportunities throughout the local rural economy. Total Federal revenue associated with the leasing and production of BLM administered minerals in McCone, Powder River, Prairie, Richland and Roosevelt counties under Alternative B is estimated to exceed $12.4 million. The redistribution of Federal revenue from these minerals is anticipated to generate $5.9 million in State revenue for Montana, and more than $1.6 million will likely be returned to the five counties to fund law enforcement and fire departments, roads and highway maintenance, public education, local clinics/hospitals and county libraries. Public services and infrastructure investments by the State and local municipalities with redistributed Federal dollars supports employment and income in the public sector and in industries providing goods and services to the public sector. The drilling, servicing, and production resulting from BLM leasing of Federal minerals in the five counties also stimulates economic activity in the private sector, directly and indirectly supporting local employment and income in nearly every part of the economy. The total economic contribution of oil and gas related activities and public revenue associated with BLM leased minerals in McCone, Powder River, Prairie, Richland and Roosevelt counties under Alternative B is estimated to be 47 jobs and $3 million in local wages and proprietor's income across the 8-county local economy.

4.4 Alternative C (BLM Preferred)

Under Alternative C, 2 whole and 5 partial parcels of the 18 lease parcels totaling ~~1,396.87~~ 1,197.34 surveyed Federal mineral acres (~~680~~ 481.21 surveyed BLM administered surface and ~~716.87~~ 716.13 surveyed private surface) would be offered for competitive oil and gas lease sale. The remaining 11 lease parcels in whole and 5 partial lease parcels, encompassing ~~6,549.15~~ 6,747.94 surveyed Federal mineral acres (~~2,958.73~~ 3,157.52 surveyed BLM administered surface and 3,590.42 private surveyed surface) would be deferred pending further review.

4.4.1 Direct Effects Common to All Resources

The action of leasing the parcels in Alternative C would, in and of itself, have no direct impact on resources. Direct effects of leasing are the creation of a valid existing right and those related to the revenue generated by the lease sale receipts.

4.4.2 Indirect Effects Common to All Resources

Any potential effects on resources from the sale of leases would occur during lease exploration and development activities, which would be subject to future BLM decision-making and NEPA analysis upon receipt of an APD or sundry notice.

Oil and gas exploration and development activities such as construction, drilling, production, infrastructure installation, vehicle traffic and reclamation could be indirect effects from leasing the lease parcels in Alternative B. As mentioned above, it is speculative to make assumptions about whether a particular lease parcel would be sold and, even if so, it is speculative to assume when, where, how, or if future surface disturbing activities associated with oil and gas exploration and development such as well sites, roads, facilities, and associated infrastructure would be proposed. It is also not known how many wells, if any, would be drilled and/or completed, the types of technologies and equipment would be used and the types of infrastructure needed for production of oil and gas. Thus, the types, magnitude and duration of potential impacts cannot be precisely quantified at this time, and would vary according to many factors.

Typical impacts to resources from oil and gas exploration and development activities such as well sites, roads, facilities, and associated infrastructure are described in the Miles City Oil & Gas Amendment/EIS (1994), the Big Dry RMP (1996), the Powder River RMP (1985), the Montana Statewide Oil & Gas Amendment/EIS (2003) and the Supplement (2008) to that document.

4.4.3 Air Resources
4.4.3.1 Air Quality
4.4.3.1.1 Direct and Indirect Effects
Direct and indirect impacts would be the same as Alternative B; however, the area potentially impacted would be reduced by ~~82~~ 84 percent due to approximately ~~6,549~~ 6,748 acres of parcels proposed for deferral pending further review. Air quality impacts would likely be slightly less than those for Alternative B. Fewer leased acres would likely result in less future development and fewer emissions than Alternative B.

4.4.3.1.2 Mitigation
Mitigation would be the same as Alternative B.

4.4.3.2 GHG Emissions
4.4.3.2.1 Direct and Indirect Effects
Alternative C CO_2e emissions are estimated to be ~~690~~ 711 mtpy less than those for Alternative B.

4.4.3.2.2 Mitigation
Mitigation would be the same as Alternative B.

4.4.3.3 Climate Change
4.4.3.3.1 Direct and Indirect Effects
Under Alternative C, climate change impacts would likely be slightly less than those for Alternative B.

4.4.3.3.2 Mitigation
Mitigation would be the same as Alternative B.

4.4.4 Soil Resources
4.4.4.1 Direct and Indirect Effects
Direct and indirect impacts would be the same as Alternative B; however, the area potentially impacted would be reduced by ~~82~~ 84 percent due to approximately ~~6,549~~ 6,748 acres of parcels proposed for deferral pending further review. Of the 11 whole and 5 partial parcels recommended for deferral, 6 whole parcels (MTM 105431- H6, H8, JA, HC, HD, HE) and 5 partial parcels (MTM 105431- H9, HF, HH and MTM 102757-WW and WT) are within sensitive soil areas and 2 whole parcels (MTM 105431- HA, HB), are within badlands outcrop

areas. Both areas are being analyzed in the current MCFO RMP planning effort. Less than one percent of the soils rated as low potential for restoration would be deferred. There are no CSU 12-1 soils stipulations applied to the deferred parcels. Soils are the same as those described in the Effected Environment section 3.3.

4.4.4.2 Mitigation

Mitigation would be the same as Alternative B.

4.4.5 Water Resources

4.4.5.1 Direct and Indirect Effects

Direct and indirect impacts would be the same as Alternative B; however, the area potentially impacted would be reduced by ~~82~~ 84 percent, due to approximately ~~6,549~~ 6,748 acres of the lease parcels proposed for deferral pending further review.

The potentially impacted acres on water resources would be decreased by ~~6,549.15~~ approximately 6,748 acres.

4.4.5.2 Mitigation

Mitigation would be the same as Alternative B.

4.4.6 Vegetation Resources

4.4.6.1 Direct and Indirect Effects

Direct and indirect impacts would be the same as Alternative B; however, the area potentially impacted would be reduced by ~~82%,~~ 84 percent, due to approximately ~~6,549~~ 6,748 acres of the lease parcels proposed for deferral pending further review.

4.4.6.2 Mitigation

Mitigation would be the same as Alternative B.

4.4.7 Riparian-Wetland Habitats

4.4.7.1 Direct and Indirect Effects

Direct and indirect impacts would be the same as Alternative B; however, the area potentially impacted would be reduced by ~~82~~ 84 percent, due to approximately ~~6,549~~ 6,748 acres of the lease parcels proposed for deferral pending further review.

The potentially impacted acres on riparian resources would be decreased by 26 acres.

4.4.7.2 Mitigation

Mitigation would be the same as Alternative B.

4.4.8 Special Status Plant Species

4.4.8.1 Direct and Indirect Effects

Direct and indirect impacts would be the same as Alternative B; however, the area potentially impacted would be reduced by ~~82%~~ 84 percent, due to approximately ~~6,549~~ 6,748 acres of the lease parcels proposed for deferral pending further review.

4.4.8.2 Mitigation
Mitigation would be that same as Alternative B.

4.4.9 Wildlife & Fisheries/Aquatics
4.4.9.1 Direct and Indirect Effects
Direct and indirect impacts would be similar to Alternative B; however, the area impacted would be reduced by ~~82%~~ 84 percent, due to these lease parcels proposed for deferral pending further review. Of the 11 whole and 5 partial parcels recommended for deferral, 3 whole parcels (MTM 105431-HK, HL, HM) are within crucial winter range and 1 partial parcel (MTM 102757-WW) is within 0.60 mile of a sage grouse lek in the PGH area. Both areas are being analyzed in the current MCFO RMP planning effort. If deferred, this alternative would reduce the amount of parcels/acreage proposed in white-tailed deer, mule deer, and pronghorn winter ranges, whooping crane potential suitable habitat, Sprague's pipit habitat, and within both sage grouse and sharp-tailed grouse habitat. Potential impacts to these resources would be reduced under this alternative. The parcels proposed for deferral overlap with the range of eleven BLM sensitive/special status aquatic species (pallid sturgeon, paddle fish, blue sucker, sturgeon chub, sauger, pearl dace, snapping turtle, spiny softshell, northern leopard frog, plains spadefoot and great plains toad). If deferred, this alternative would reduce the impacts to these BLM sensitive aquatic species' habitat.

4.4.9.2 Mitigation
Mitigation would be the same as Alternative B.

4.4.10 Cultural
4.4.10.1 Direct and Indirect Effects
Impacts would be similar to those disclosed in Alternative B; however, the area impacted would be reduced by ~~82%~~84 percent, due to these lease parcels proposed for deferral pending further review. Specifically, potential effects would not occur on the 16 whole or partial lease parcels consisting of ~~6,549~~ 6,748 acres proposed for deferral. The new analyses for parcels to be leased are as follows below.

Based on modeling, all or portions of four lease parcels (MTM 105431-HF (120 acres); MTM 105431-HG (160 acres); MTM 105431-HH (80 acres); MTM 105431-HJ (317 acres)), in Powder River County (677 acres) might contain 8 cultural sites of which one to two could have the potential to be eligible or considered eligible for listing on the National Register of Historic Places.

Based on modeling, all or portions of two lease parcels (MTM 102757-WT (319 acres); MTM 102757-WW (~~361~~ 159 acres)), in Prairie County (680 acres) might contain up to 8 cultural sites of which one to two could have the potential to be eligible or considered eligible for listing on the National Register of Historic Places.

Based on modeling, a portion of one lease parcel (MTM 105431-H9 (40 acres)) located in Roosevelt County (40 acres) might contain one cultural site which could have potential to be eligible or considered eligible for listing on the National Register of Historic Places.

Leasing the ~~1,397~~ approximately 1,197 acres of federal minerals within the above Counties could directly or indirectly affect 15 cultural sites with 1 to 3 sites having the potential to be eligible or considered eligible for listing on the National Register of Historic Places.

The Reasonable Foreseeable Development (RFD and Appendix D) scenario for the lease parcels is the same as Alternative B.

4.4.10.2 Mitigation
Mitigation would be the same as Alternative B where the application of standard lease terms, stipulations, and cultural lease notices provide mechanisms to protect vulnerable significant cultural resource values on these lease parcels (Appendix A). Lease notice LN 14-2 would be applied to 1 lease parcel (MTM 105431-H9).

4.4.11 Native American Religious Concerns
4.4.11.1 Direct and Indirect Effects
Direct and indirect impacts would be the same as Alternative B. Areas potentially impacted would be reduced by approximately ~~82 %~~ 84 percent, due to ~~6,549~~ approximately 6,747 acres being deferred pending further analysis. The deferred parcels include Parcel MTM 105431-H9 which contains the three stone circle sites mentioned in Chapter 3.

4.4.11.2 Mitigation
If the parcels are leased, mitigation would be the same as Alternative B.

4.4.12 Paleontology
4.4.12.1 Direct and Indirect Effects
Direct and indirect impacts would be the same as Alternative B; however, the area potentially impacted would be reduced by ~~82~~ 84 percent, due to approximately ~~6,549~~ 6,747 acres of lease parcels proposed for deferral pending further review. Specifically, effects would not occur on the lease parcels in whole or part proposed for deferral.

4.4.12.2 Mitigation
Mitigation would be the same as Alternative B, except the recommendation to apply Paleontological lease notice 14-12 would only apply to 2 whole leases and portions of 5 others because lease parcels in whole or part are proposed for deferral.

4.4.13 Visual Resources
4.4.13.1 Direct and Indirect Effects
Under this alternative, 2 whole and 5 partial parcels that include ~~1,396.87~~ 1,197.34 surveyed surface acres of which ~~680~~ 481.21 surveyed acres are BLM administered surface and ~~716.87~~ 716.13 surveyed acres are non-federal surface would be offered for lease.

Direct and indirect impacts would be the same as Alternative B; however, the area potentially impacted would be reduced, due to approximately ~~6,549.15~~ 6,748 surface acres of 11 whole and 5 partial lease parcels being proposed for deferral, pending further review. The parcels or portions of parcels proposed for deferral consist of ~~2,958.73~~ approximately 3,158 BLM administered surface acres and approximately 3,590 non-federal surface acres.

There are no areas located within a VRM Class II management objective.

4.4.13.2 Mitigation
Mitigation would be the same as Alternative B.

4.4.14 Forest and Woodland Resources
4.4.14.1 Direct and Indirect Effects
Direct and indirect impacts would be the same as Alternative B; however, the area potentially impacted would be reduced ~~substantially~~ by 84 percent, due to approximately ~~6,549~~ 6,748 acres of lease parcels proposed for deferral pending further review. Under this alternative, acreage potentially impacted would be approximately 10 acres of riparian woodland.

4.4.14.2 Mitigation
Mitigation would be the same as Alternative B.

4.4.15 Livestock Grazing
4.4.15.1 Direct and Indirect Effects
Direct and indirect impacts would be the same as Alternative B. The deferred parcels pending further review do not have grazing authorizations.

4.4.15.2 Mitigation
Mitigation would be the same as Alternative B.

4.4.16 Recreation and Travel Management
4.4.16.1 Direct and Indirect Effects
Under this alternative, 2 whole and 5 partial parcels that include ~~1,396.87~~ 1,197.34 surveyed surface acres of which ~~680~~ 481.21 surveyed acres are BLM administered surface and ~~716.87~~ 716.13 surveyed acres are non-federal surface would be offered for lease.

Direct and indirect impacts would be the same as Alternative B; however, the area potentially impacted would be reduced by 84 percent, due to approximately ~~6,549.15~~ 6,748 surface acres of 11 whole and 5 partial lease parcels being proposed for deferral, pending further review. The parcels or portions of parcels proposed for deferral consist of ~~2,958.73~~ approximately 3,158 BLM administered surface acres and approximately 3,590 non-federal surface acres.

There are no Special Recreation Management Areas or current Travel Management Areas within any of the proposed leased areas or deferred areas.

4.4.16.2 Mitigation
Mitigation would be the same as Alternative B.

4.4.17 Lands and Realty
4.4.17.1 Direct and Indirect Effects
Under this alternative, 2 whole and 5 partial parcels that include ~~1,396.87~~ 1,197.34 surveyed surface acres of which ~~680~~ 481.21 surveyed acres are BLM administered surface and ~~716.87~~

716.13 surveyed acres are non-federal surface would be offered for lease.

Direct and indirect impacts would be the same as Alternative B; however, the area potentially impacted would be reduced by 84 percent, due to approximately ~~6,549.15~~ 6,748 surface acres of 11 whole and 5 partial lease parcels being proposed for deferral, pending further review. The parcels or portions of parcels proposed for deferral consist of approximately 3,158 BLM administered surface acres and approximately 3,590 non-federal surface acres.

Based on the Master Title plats and LR2000 reports, parcel MTM-102757-WT would be affected by authorized BLM ROWs on BLM administered surface.

4.4.17.2 Mitigation

Measures would be taken to avoid disturbance to or impacts to existing rights-of-way, in the event of any oil and gas exploration and development activities. Any new "off-lease" or third party rights-of-way required across federal surface for exploration and/or development of the 18 parcels would be subject to lands and realty stipulations to protect other resources as determined by environmental analyses. In order to protect the existing rights-of-way it is recommended that LN 14-1 be applied to lease parcel MTM-102757-WT.

4.4.18 Minerals

4.4.18.1 Fluid Minerals

4. 4.18.1.1 Direct and Indirect Effects

Direct and indirect impacts would be the same as Alternative B; however, the area potentially impacted would be reduced by ~~82%~~ 84 percent, due to approximately ~~6,549.15~~ 6,748 acres of lease parcels proposed for deferral pending further review. The remaining ~~11~~ 2 whole and 5 partial lease parcels would be offered for lease subject to major (NSO) or moderate (CSU) constraints and/or standard lease terms and conditions.

Deferring lease parcels would result in delays of some development plans, relocation of development to state or private leases, or completely eliminate development plans because of the need to include federal acreage as part of a plan. In addition, less natural gas or crude oil would enter the public markets.

4.4.19 Special Designations

4.4.19.1 Direct and Indirect Effects

Under this alternative, 2 whole parcels and parts of 5 would be offered for lease. Totaling ~~1,397~~ 1,236.34 surveyed surface acres of which are ~~680~~ approximately 481 BLM administered surface and 717 acres of non-federal surface.

Direct and indirect impacts would be the same as Alternative B; however, the area potentially impacted would be reduced to approximately 17.6% of Alternative B acres (~~1,397~~ 1,197.34 acres) due to approximately ~~6,548~~ 6,748 surface acres of all or portions of 16 lease parcels being proposed for deferral, pending further review. The parcels or portions of parcels proposed for deferral consist of ~~2,958~~ approximately 3,158 BLM administered surface acres and 3,590 non-federal surface acres.

There are no Lease parcels, located within the 3 mile sensitive Setting Consideration Zone (SCZ) around the Lewis and Clark National Historic Trail Corridor.

4.4.19.2 Mitigation
Since no parcels would be offered, under Alterative C that would be in the Lewis and Clark NHT no mitigation measures would be necessary.

4.4.20 Social and Economic Conditions
4.4.20.1 Social
4.4.20.1.1 Direct and Indirect Effects
Direct and indirect impacts would be the same as Alternative B; however, the area potentially impacted would be reduced by less than ~~82%~~84 percent, due to the deferral of ~~6,549.15~~ approximately 6,748 acres of lease parcels in McCone, Richland, Roosevelt, Prairie, and Powder River Counties.

4.4.20.2 Economics
4.4.20.2.1 Direct and Indirect Impacts
Economic impacts associated with Alternative C would be very similar to those described for Alternative B. Under this alternative, leasing an additional ~~1,397~~ 1,197 acres of federal minerals could increase average annual oil and gas leasing and rent revenues to the federal government by an estimated $6,000. Average annual leasing and rent revenues that could be distributed to the state government could increase by an estimated $3,000. Average annual federal oil and gas royalties would increase by an estimated $36,000. Average annual royalties distributed to the state could increase by an estimated $17,000 and revenue distributed to the five counties could increase by $5,000.

Total average annual federal revenues and associated annual rent and royalty revenues related to average annual production of federal minerals could amount to an estimated $42,000. Total average annual revenues from leasing, rent, and royalties distributed to the state could be an estimated $20,000. Total estimated revenues distributed to the counties could be about $5,000.

The estimated combined total average annual employment and income supported by additional federal oil and gas leasing, distributions of royalties to local governments, drilling wells, and production would amount to no change in employment and an additional $12,000 labor income within the local economy (IMPLAN, 2014).

The annual SCC associated with Alternative C oil and gas development is $6,769 (in 2011 dollars). As noted earlier, the estimated SCC is not directly comparable to economic contributions.

Total federal contribution under Alternative C and anticipated related exploration, development, and production of oil and gas could cause local employment and labor income to be very similar to impacts expected from Alternative B.

4.4.21 Cumulative Impacts- Alternative C
Direct and indirect impacts would be similar to Alternative B. Under this alternative, the cumulative effects of federal mineral leasing within the local economy as well as the specific effects of leasing an additional 1,397 acres are summarized in Table 15 and Table 16. These tables also display in comparative form the cumulative effects of alternatives A, B, and C.

4.4.21.1 Past, Present and Reasonably Foreseeable Future Actions
The past, present, or reasonably foreseeable future actions that affect the same components of the environment as the Proposed Action are: grazing, roads, wildfire and prescribed fire, range improvement projects, and utility right-of-ways, which are the same as Alternative B.

4.4.21.2 Cumulative Impacts by Resource
Cumulative effects for all resources in the MCFO are described in the final Big Dry RMP/EIS (pgs. 111 to 156) and the 1992 Oil and Gas Amendment of the Billings, Powder River, and South Dakota Resource Management Plans and Final Environmental Impact Statement and the 1994 Record of Decision and the 2008 Final Supplement to the Montana Statewide Oil and Gas Environmental Impact with a development alternative for coal bed natural gas production (4-1 to 4-310). Anticipated exploration and development activity associated with the lease parcels considered in this EA are within the range of assumptions used and effects described in this cumulative effects analysis for resources other than climate, wildlife, and economics resources.

4.4.21.3 Greenhouse Gas Emissions and Cumulative Impacts on Climate Change
CO_2e emissions are estimated to be 690 metric tons/year less than Alternative B.

4.4.21.4 Cumulative Impacts of Climate Change
Due to the slight decrease in CO_2e emissions under Alternative C, cumulative climate change impacts on resources would be slightly less than those for Alternative B.

4.4.21.5 Cumulative Impacts to Wildlife & Fisheries/Aquatics
Cumulative impacts would be the same as Alternative B; however, the area potentially impacted would be reduced by 11 whole parcels and portions of 5 other parcels pending further review. If the remaining lease parcels are developed, potential additional cumulative impacts to wildlife would occur over less area than what is described in Alternative B.

4.4.21.6 Cumulative Impacts to Economic Conditions:
Direct and indirect impacts would be similar to Alternative B. Under this alternative, the cumulative effects of federal mineral leasing within the local economy as well as the specific effects of leasing an additional ~~1,397~~ 1,197 acres are summarized in Table 15 and Table 16. These tables also display in comparative form the cumulative effects of alternatives A, B, and C.

5.0 CONSULTATION AND COORDINATION

5.1 Persons, Agencies, and Organizations Consulted
Coordination with MFWP was conducted for the 18 lease parcels being reviewed and in the completion of this EA in order to prepare the analysis, identify protective measures, and apply stipulations and lease notices associated with these parcels being analyzed. Recommendations

by the USFWS applied in previous lease sale EAs were also applied to the 18 lease parcels being reviewed. A letter was sent to the USFWS and MFWP during the 15-day scoping and 30-day public comment periods requesting comments on the 18 parcels being reviewed.

The BLM consults with Native Americans under Section 106 of the National Historic Preservation Act. The BLM sent letters to tribes in Montana, North and South Dakota and Wyoming at the beginning of the 15 day scoping period informing them of the potential for the 18 parcels to be leased and inviting them to submit issues and concerns BLM should consider in the environmental analysis. Letters were sent to the Tribal Presidents and THPO or other cultural contacts for the Cheyenne River Sioux Tribe, Crow Tribe of Montana, Crow Creek Sioux Tribe, Eastern Shoshone Tribe, Ft. Peck Tribes, Lower Brule Sioux Tribe, the Mandan, Hidasta, and Arkira Nation, Northern Arapaho Nation, Northern Cheyenne Tribe, Oglala Sioux Tribe, Rosebud Sioux Tribe of Indians, Standing Rock Sioux Tribe, and Turtle Mountain Band of Chippewa. In addition to scoping letters, THPOs also received file search results from the preliminary review of parcels conducted by BLM. The BLM sent a second letter with a copy of the EA to the tribes informing them about the 30 day public comment period for the EA and solicit any information BLM should consider before making a decision whether to offer any or all of the 18 parcels for sale.

5.2 Summary of Public Participation

5.2.1 Scoping

Public scoping for this project was conducted through a 15-day scoping period advertised on the BLM Montana State Office website and posting on the field office website NEPA notification log. Scoping was initiated March 25, 2014. Montana Fish Wildlife and Parks (MFWP) submitted comments on the October 2014 lease sale.

MFWP recommended applying a 1/4 mile buffer along the parcels along Schoolhouse Coulee, Renz Creek, and the tributary to Two-mile creek in parcels MTM 105431-HB and MTM 105431-H8. In review, the BLM have already applied a No Surface Occupancy (NSO 11-2) for parcel MTM 105431 HB where Schoolhouse Coulee and Renz Creek occur. The Big Dry RMP does not have a stipulation for a ¼ mile buffer along tributaries of waterways. After reviewing nominated lease parcel MTM 105431-H8, it is determined that the No Surface Occupancy stipulation for waterbodies, floodpains, and riparian areas should not be applied. Two-mile Creek does run through the parcel, but according to the best available information, it is ephemeral at this location and appears to lack defined channel. If this lease was to be developed and sensitive resources were identified at the proposed well location, BLM would use its regulatory authority to move the proposed well location up to 660 feet in order to protect sensitive resources.

MFWP recommend applying timing limitation 13-1 for big game winter ranges. In review, the BLM have already applied this timing stipulation to the necessary parcels. MFWP recommend surveys for sharp-tailed grouse leks and sage grouse leks to occur prior to development of some of the parcels. The Big Dry RMP or Powder River RMP does not have a stipulation for pre-development surveys for sage grouse or sharp-tailed grouse. However, in some cases where necessary, the BLM has had required companies to conduct these surveys prior to authorizing development at the Application for Permit to Drill (APD) stage before development. Recent inventories for sage grouse leks have not been conducted within some of the parcels. If the leases were to be developed, inventories would be conducted if the leases were to be developed at the

APD stage of development to determine the presence or absence of sage grouse leks. Similarly, recent inventories of sharp-tailed grouse dancing grounds have not been conducted within some of the parcels. Thus, inventories would be conducted prior to development at the APD stage before development to determine the presence or absence of sharp-tailed grouse dancing grounds.

5.2.2 Public Comment Period

On May 19, 2014, the EA, along with an unsigned FONSI, was made available for a 30-day public comment period. Notification letters were distributed to external entities, local agencies, and tribes to explain that an EA and the unsigned FONSI were available for review and comment. Tribes also received a copy of the EA and unsigned FONSI for their review.

A total of 3 written submissions were received during the 30-day comment period, which resulted in 14 individually-coded substantive comments. After review and consideration of the comments, some modifications have been made to the EA. Changes made to the analysis are noted with gray-scale shading and/or strikeout so the modifications to the EA can easily be identified.

The following is a summary of some of the issues and/or changes made to the EA as a result of the 30-day public comment period:

- Emissions inventory of criteria air pollutants and volatile organic compound emissions
- Photochemical Grid Modeling (PGM) study on the lease parcels and additional mitigation measures pending the outcome of the PGM efforts on ARMP
- Surface and groundwater protection measures
- Development of new lease notice to inform lessee/operator of Tribal consultation during development stage
- Consideration of wildlife resources mitigation measures and deferrals for sage grouse, sharp-tailed grouse, and big game. Based on recent MT FWP sage grouse survey data, additional lands were recommended for deferral in the Preferred Alternative.

After the 30-day protest period, but before lease issuance, the BLM will issue the Decision Record and signed Finding of No Significant Impact for this EA. This information, along with other updates and Lease Sale Notice information can be found on the Montana/Dakotas BLM website http://blm.gov/qtld. Current and updated information about our EAs, Lease Sale Notices, and corresponding information pertaining to this sale can be found at the link referenced above.

5.3 List of Preparers

Table 20. List of Preparers

Name	Title	Responsible for the Following Section(s) of this Document
Susan Bassett	Air Specialist	Air Resources
Bobby Baker	Wildlife Biologist	Wildlife

Chris Robinson	Hydrologist	Water Resources/Riparian Vegetation
Will Hubbell	Archaeologist	Cultural/Special Designations
Josh Halpin	Range Management Specialist	Soils
Shane Findlay	Supervisory Land Use Specialist	Recreation/VRM/Travel Management
Russell Slatton	Natural Resource Specialist	GIS
Kirk Anderson	Rangeland Management Specialist	Livestock Grazing/Vegetation/Invasive Species
Doug Melton	Archeologist	Native American Religious Concerns
Greg Liggitt	Paleontologist	Paleontology
Beth Klempel	Realty Specialist	Lands/Realty
Paul Helland	Petroleum Engineer	Fluid Minerals/RFD
Jon David	Natural Resource Specialist	EA Lead/Forestry
Irma Nansel	Planning & Environmental Coordinator	EA Lead
Margaret Langlas Ward	Land Use Specialist	NEPA
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Jessica Montag	Social Analyst	Social Analysis
Jennifer Dobbs	Economist	Economic Analysis
Samantha Iron Shirt	Legal Land Examiner-Sale Lead	Expressions of Interest/Lease Sale

In addition to the primary preparers listed above, the following individuals provided document review:

Todd Yeager	Field Manager
Diane Friez	District Manager

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7.0 DEFINITIONS

The North American Industry Classification System (NAICS) is the standard used by federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy. NAICS was developed under the auspices of the Office of Management and Budget (OMB), and adopted in 1997 to replace the Standard Industrial Classification (SIC) system and to allow for a high level of comparability in business statistics among the North American countries.

IMPLAN: The IMPLAN Model is the most flexible, detailed and widely used input-output impact model system in the U.S. It provides users with the ability to define industries, economic relationships and projects to be analyzed. It can be customized for any county, region or state, and used to assess "multiplier effects" caused by increasing or decreasing spending in various parts of the economy. This can be used to assess the economic impacts of resource management decisions, facilities, industries, or changes in their level of activity in a given area. The current IMPLAN input-output database and model is maintained and sold by MIG, Inc. (Minnesota IMPLAN Group). The 2007 data set was used in this analysis is.

APPENDIX A

PARCEL NUMBER	PARCEL DESCRIPTION	PROPOSED FOR LEASING ALTERNATIVE B	PROPOSED FOR LEASING IF EA INCLUDES ALTERNATIVE C	PROPOSED FOR DEFERRAL-NO LEASING
MTM 102757-WT	T. 13 N, R. 45 E, PMM, MT SEC. 18 LOTS 1,2; SEC. 18 NE,E2NW; SEC. 20 ALL; PRAIRIE COUNTY 961.22 AC ACQ	**CR 16-1** (ALL LANDS) **LN-14-1** SEC. 18 W2NE; **LN 14-11** (ALL LANDS) **LN 14-12** (ALL LANDS) **LN 14-15** (ALL LANDS) **NSO 11-2** SEC. 20 E2E2; **NSO 11-8** SEC. 18 LOT 2; SEC. 18 S2NE,SENW; SEC. 20 NWNW; **TES 16-2** (ALL LANDS) **TL 13-1** (ALL LANDS) **TL 13-3** SEC. 18 LOTS 1,2; SEC. 18 NE,E2NW; SEC. 20 N2,NESW,N2SE,SESE;	T. 13 N, R. 45 E, PMM, MT SEC. 18 LOTS 1,2; SEC. 18 NE,E2NW; SEC. 20 SENE; PRAIRIE COUNTY **CR 16-1** (ALL LANDS) **LN-14-1 (**ALL LANDS) **LN 14-11** (ALL LANDS) **LN 14-12** (ALL LANDS) **LN 14-15** (ALL LANDS) **NSO 11-2** SEC. 20 SENE; **NSO 11-8** SEC. 18 LOT 2; SEC. 18 S2NE,SENW; **TES 16-2** (ALL LANDS) **TL 13-1** (ALL LANDS) **TL 13-3** SEC. 18 LOTS 1,2; SEC. 18 NE,E2NW;	T. 13 N, R. 45 E, PMM, MT SEC. 20 NENE,W2NE,NW,S2; PRAIRIE COUNTY Pending further review of sensitive soil areas being analyzed in the current MCFO RMP planning effort.

PARCEL NUMBER	PARCEL DESCRIPTION	PROPOSED FOR LEASING ALTERNATIVE B	PROPOSED FOR LEASING IF EA INCLUDES ALTERNATIVE C	PROPOSED FOR DEFERRAL-NO LEASING
MTM 102757-WW	T. 14 N, R. 45 E, PMM, MT SEC. 2 LOTS 3,4; SEC. 2 S2NW,SW; SEC. 4 LOTS 1-4; SEC. 4 S2N2,S2; PRAIRIE COUNTY 958.02 AC ACQ	**CR 16-1** (ALL LANDS) **LN 14-11** (ALL LANDS) **LN 14-12** (ALL LANDS) **LN 14-15** (ALL LANDS) **NSO 11-2** SEC. 4 LOTS 1-3; SEC. 4 S2NE,SWNW,W2SW,SE; **NSO 11-4** SEC. 4 SWNE, S2NW, N2SW, SESW,W2SE; **TES 16-2** (ALL LANDS) **TL 13-1** SEC. 2 LOT 4; SEC. 2 S2NW, NWNW; SEC. 4 LOTS 1-4; SEC. 4 S2N2, S2; **TL 13-3** (ALL LANDS) **TL 13-4** SEC. 4 LOTS 1,2; SEC. 4 S2NE,SENW,E2SW,SE;	T. 14 N, R. 45 E, PMM, MT SEC. 2 LOTS 3,4; SEC. 2 S2NW; ~~SEC. 4 LOT 4;~~ ~~SEC. 4 SENW,E2SW;~~ PRAIRIE COUNTY **CR 16-1** (ALL LANDS) **LN 14-11** (ALL LANDS) **LN 14-12** (ALL LANDS) **LN 14-15** (ALL LANDS) **TES 16-2** (ALL LANDS) **TL 13-1** SEC. 2 LOT 4; SEC. 2 S2NW; **TL 13-3** (ALL LANDS)	T. 14 N, R. 45 E, PMM, MT SEC. 2 SW; ~~SEC. 4 LOTS 1-3;~~ ~~SEC. 4 S2NE,SWNW,W2SW,SE;~~ SEC. 4 LOTS 1-4; SEC. 4 S2N2,S2; PRAIRIE COUNTY Pending further review of sensitive soils and sage grouse areas being analyzed in the current MCFO RMP planning effort.
MTM 105431-HA	T. 26 N, R. 50 E, PMM, MT SEC. 24 SENE; MCCONE COUNTY 40.00 AC PD	**CR 16-1** (ALL LANDS) **LN 14-12** (ALL LANDS) **LN 14-15** (ALL LANDS) **TES 16-2** (ALL LANDS)	DEFER ALL LANDS	DEFER ALL LANDS Pending further review of badlands rock outcrop areas being analyzed in the current MCFO RMP planning effort.

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PARCEL NUMBER	PARCEL DESCRIPTION	PROPOSED FOR LEASING ALTERNATIVE B	PROPOSED FOR LEASING IF EA INCLUDES ALTERNATIVE C	PROPOSED FOR DEFERRAL-NO LEASING
MTM 105431-HB	T. 26 N, R. 52 E, PMM, MT SEC. 3 LOTS 1-3; SEC. 3 S2NE,SENW,SE; SEC. 10 E2; SEC. 15 NWNE,W2SW; RICHLAND COUNTY 830.48 AC PD	**CR 16-1** (ALL LANDS) **CSU 12-1** SEC. 10 N2,SE; **LN-14-1** SEC. 10 N2E2; **LN 14-12** (ALL LANDS) **LN 14-14** (ALL LANDS) **LN 14-15** (ALL LANDS) **NSO 11-2** SEC. 3 LOT 2; SEC. 3 S2NE; NESE; **TES 16-2** (ALL LANDS) **TL 13-1** (ALL LANDS)	DEFER ALL LANDS	DEFER ALL LANDS Pending further review of badlands rock outcrop areas being analyzed in the current MCFO RMP planning effort.
MTM 105431-H6	T. 26 N, R. 55 E, PMM, MT SEC. 4 LOT 4; SEC. 4 SWNW,SW; RICHLAND COUNTY 241.91 AC PD	**CR 16-1** (ALL LANDS) **LN 14-12** (ALL LANDS) **LN 14-15** (ALL LANDS) **TES 16-2** (ALL LANDS) **TL 13-1** (ALL LANDS) **TL 13-3** (ALL LANDS)	DEFER ALL LANDS	DEFER ALL LANDS Pending further review of sensitive soil areas being analyzed in the current MCFO RMP planning effort.
MTM 105431-H8	T. 27 N, R. 55 E, PMM, MT SEC. 30 LOT 4; SEC. 30 S2SE; RICHLAND COUNTY 116.82 AC PD	**CR 16-1** (ALL LANDS) **LN 14-12** (ALL LANDS) **LN-14-1** SEC. 30 LOT 4; **LN 14-14** (ALL LANDS) **LN 14-15** (ALL LANDS) **NSO 11-4** SEC. 30 LOT 4; **TES 16-2** (ALL LANDS) **TL 13-1** (ALL LANDS) **TL 13-3** (ALL LANDS)	DEFER ALL LANDS	DEEFER ALL LANDS Pending further review of sensitive soil areas being analyzed in the current MCFO RMP planning effort.

PARCEL NUMBER	PARCEL DESCRIPTION	PROPOSED FOR LEASING ALTERNATIVE B	PROPOSED FOR LEASING IF EA INCLUDES ALTERNATIVE C	PROPOSED FOR DEFERRAL-NO LEASING
MTM 105431-H9	T. 30 N, R. 58 E, PMM, MT SEC. 1 LOT 1; SEC. 12 NENE,S2NE; ROOSEVELT COUNTY 160.02 AC PD	**CR 16-1** (ALL LANDS) **LN 14-2** (ALL LANDS) **LN 14-12** (ALL LANDS) **LN 14-14** (ALL LANDS) **LN 14-15** (ALL LANDS) **NSO 11-2** (ALL LANDS) **TES 16-2** (ALL LANDS)	T. 30 N, R. 58 E, PMM, MT SEC. 12 NENE; ROOSEVELT COUNTY **CR 16-1** (ALL LANDS) **LN 14-2** (ALL LANDS) **LN 14-12** (ALL LANDS) **LN 14-14** (ALL LANDS) **LN 14-15** (ALL LANDS) **NSO 11-2** (ALL LANDS) **TES 16-2** (ALL LANDS)	T. 30 N, R. 58 E, PMM, MT SEC. 1 LOT 1; SEC. 12 S2NE; ROOSEVELT COUNTY Pending further review of sensitive soil areas being analyzed in the current MCFO RMP planning effort.
MTM 105431-JA	T. 30 N, R. 59 E, PMM, MT SEC. 6 LOT 4; ROOSEVELT COUNTY 39.94 AC PD	**CR 16-1** (ALL LANDS) **LN 14-12** (ALL LANDS) **LN 14-15** (ALL LANDS) **NSO 11-2** (ALL LANDS) **TES 16-2** (ALL LANDS)	DEFER ALL LANDS	DEFER ALL LANDS Pending further review of sensitive soil areas that are being analyzed in the current MCFO RMP planning effort.
MTM 105431-HC	T. 8 S, R. 51 E, PMM, MT SEC. 9 SESW,SE; SEC. 10 NENE,S2NE,S2; POWDER RIVER COUNTY 640.00 AC PD	**CR 16-1** (ALL LANDS) **LN 14-12** (ALL LANDS) **NSO 11-2** SEC. 9 SESW,NWSE; SEC. 10 NENE,S2NE,NESE,SWSE; **TES 16-2** (ALL LANDS) **TL 13-1** SEC. 10 ALL; **TL 13-3** SEC. 9 SESW; SEC. 10 S2SE;	DEFER ALL LANDS	DEFER ALL LANDS Pending further review of sensitive soil areas being analyzed in the current MCFO RMP planning effort.

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PARCEL NUMBER	PARCEL DESCRIPTION	PROPOSED FOR LEASING ALTERNATIVE B	PROPOSED FOR LEASING IF EA INCLUDES ALTERNATIVE C	PROPOSED FOR DEFERRAL-NO LEASING
MTM 105431-HD	T. 8 S, R. 51 E, PMM, MT SEC. 11 ALL; POWDER RIVER COUNTY 640.00 AC PD	**CR 16-1** (ALL LANDS) **NSO 11-2** SEC. 11 SWNW,SWSW; **LN 14-12** (ALL LANDS) **TES 16-2** (ALL LANDS) **TL 13-1** (ALL LANDS) **TL 13-3** SEC. 11 N2N2,S2S2;	DEFER ALL LANDS	DEFER ALL LANDS Pending further review of sensitive soil areas in current MCFO RMP planning effort.
MTM 105431-HE	T. 8 S, R. 51 E, PMM, MT SEC. 26 SW; POWDER RIVER COUNTY 160.00 AC PD	**CR 16-1** (ALL LANDS) **LN 14-12** (ALL LANDS) **NSO 11-2** SEC. 26 NESW; **NSO 11-2** SEC. 26 NESW; **TES 16-2** (ALL LANDS) **TL 13-1** (ALL LANDS) **TL 13-3** (ALL LANDS)	DEFER ALL LANDS	DEFER ALL LANDS Pending further review of sensitive soil areas in current MCFO RMP planning effort.
MTM 105431-HG	T. 9 S, R. 51 E, PMM, MT SEC. 11 NE; POWDER RIVER COUNTY 160.00 AC PD	**CR 16-1** (ALL LANDS) **LN 14-11** (ALL LANDS) **LN 14-12** (ALL LANDS) **NSO 11-8** (ALL LANDS) **TES 16-2** (ALL LANDS) **TL 13-1** (ALL LANDS) **TL 13-3** (ALL LANDS)	T. 9 S, R. 51 E, PMM, MT SEC. 11 NE; POWDER RIVER COUNTY **CR 16-1** (ALL LANDS) **LN 14-11** (ALL LANDS) **LN 14-12** (ALL LANDS) **NSO 11-8** (ALL LANDS) **TES 16-2** (ALL LANDS) **TL 13-1** (ALL LANDS) **TL 13-3** (ALL LANDS)	

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PARCEL NUMBER	PARCEL DESCRIPTION	PROPOSED FOR LEASING ALTERNATIVE B	PROPOSED FOR LEASING IF EA INCLUDES ALTERNATIVE C	PROPOSED FOR DEFERRAL-NO LEASING
MTM 105431-HH	T. 9 S, R. 51 E, PMM, MT SEC. 22 E2; SEC. 27 N2NW,SWNW; POWDER RIVER COUNTY 440.00 AC PD	**CR 16-1** (ALL LANDS) **LN 14-12** (ALL LANDS) **NSO 11-2** SEC. 22 W2NE,SENE,NESE; SEC. 27 NENW; **TL 13-1** (ALL LANDS) **TES 16-2** (ALL LANDS)	T. 9 S, R. 51 E, PMM, MT SEC. 22 E2NE; POWDER RIVER COUNTY **CR 16-1** (ALL LANDS) **LN 14-12** (ALL LANDS) **NSO 11-2** SEC. 22 SENE; **TL 13-1** (ALL LANDS) **TES 16-2** (ALL LANDS)	T. 9 S, R, 51 E, PMM, MT SEC. 22 W2NE,SE; SEC. 27 N2NW,SWNW; POWDER RIVER COUNTY Pending further review of sensitive soils areas in current MCFO RMP planning effort.
MTM 105431-HJ	T. 9 S, R. 51 E, PMM, MT SEC. 27 S2SW; SEC. 28 SESE; SEC. 33 NENE; SEC. 34 LOT 1; SEC. 34 W2NW,NWSW; POWDER RIVER COUNTY 316.87 AC PD	**CR 16-1** (ALL LANDS) **LN 14-12** (ALL LANDS) **NSO 11-2** SEC. 27 S2SW; SEC. 28 SESE; SEC. 33 NENE; SEC. 34 NWNW,NWSW; **TES 16-2** (ALL LANDS) **TL 13-1** (ALL LANDS)	T. 9 S, R. 51 E, PMM, MT SEC. 27 S2SW; SEC. 28 SESE; SEC. 33 NENE; SEC. 34 LOT 1; SEC. 34 W2NW,NWSW; POWDER RIVER COUNTY **CR 16-1** (ALL LANDS) **LN 14-12** (ALL LANDS) **NSO 11-2** SEC. 27 S2SW; SEC. 28 SESE; SEC. 33 NENE; SEC. 34 NWNW,NWSW; **TES 16-2** (ALL LANDS) **TL 13-1** (ALL LANDS)	

APPENDIX A

PARCEL NUMBER	PARCEL DESCRIPTION	PROPOSED FOR LEASING ALTERNATIVE B	PROPOSED FOR LEASING IF EA INCLUDES ALTERNATIVE C	PROPOSED FOR DEFERRAL-NO LEASING
MTM 105431-HF	T. 8 S, R. 52 E, PMM, MT SEC. 32 ALL; POWDER RIVER COUNTY 640.00 AC PD	**CR 16-1** (ALL LANDS) **LN 14-11** (ALL LANDS) **LN 14-12** (ALL LANDS) **NSO 11-2** SEC. 32 N2NE,W2SW,SESW; **TES 16-2** (ALL LANDS) **TL 13-1** (ALL LANDS) **TL 13-3** SEC. 32 SWNE,NWNW,S2NW, SW,W2SE,SESE;	T. 8 S, R. 52 E, PMM, MT SEC. 32 N2NW, SESW; POWDER RIVER COUNTY **CR 16-1** (ALL LANDS) **LN 14-11** (ALL LANDS) **LN 14-12** (ALL LANDS) **NSO 11-2** SEC. 32 SESW; **TES 16**-2 (ALL LANDS) **TL 13-1** (ALL LANDS) **TL 13-3** (ALL LANDS)	T. 8 S, R. 52 E, PMM, MT SEC. 32 NE,S2NW,W2SW,NESW,SE; POWDER RIVER COUNTY Pending further review of sensitive soil areas in current MCFO RMP planning effort.
MTM 105431-HK	T. 9 S, R. 52 E, PMM, MT SEC. 23 ALL; POWDER RIVER COUNTY 640.00 AC PD	**CR 16-1** (ALL LANDS) **NSO 11-2** SEC. 23 SWNE,SWSW; **TES 16-2** (ALL LANDS) **TL 13-1** (ALL LANDS) **TL 13-3** SEC. 23 S2NE,S2;	DEFER ALL LANDS	DEFER ALL LANDS Pending further review of crucial mule deer winter range habitat in the current MCFO RMP planning effort.
MTM 105431-HL	T. 9 S, R. 52 E, PMM, MT SEC. 26 ALL; POWDER RIVER COUNTY 640.00 AC PD	**CR 16-1** (ALL LANDS) **LN 14-12** (ALL LANDS) **NSO 11-2** SEC. 26 S2NE,NENW,NESE; **TES 16-2** (ALL LANDS) **TL 13-1** (ALL LANDS) **TL 13-3** (ALL LANDS)	DEFER ALL LANDS	DEFER ALL LANDS Pending further review of crucial mule deer winter range habitat in the current MCFO RMP planning effort.

PARCEL NUMBER	PARCEL DESCRIPTION	PROPOSED FOR LEASING ALTERNATIVE B	PROPOSED FOR LEASING IF EA INCLUDES ALTERNATIVE C	PROPOSED FOR DEFERRAL-NO LEASING
MTM 105431-HM	T. 9 S, R. 52 E, PMM, MT SEC. 27 E2; POWDER RIVER COUNTY 320.00 AC PD	**CR 16-1** (ALL LANDS) **LN 14-12** (ALL LANDS) **NSO 11-2** SEC. 27 NWSE; **TL 13-1** (ALL LANDS) **TL 13-3** (ALL LANDS) **TES 16-2** (ALL LANDS)	DEFER ALL LANDS	DEFER ALL LANDS Pending further review of crucial mule deer winter range habitat in the current MCFO RMP planning effort.

Appendix B – Miles City Field Office Stipulation Descriptions

Stipulation Number	Stipulation Name/Brief Description
CR 16-1	**CULTURAL RESOURCES LEASE STIPULATION** This lease may be found to contain historic properties and/or resources protected under the National Historic Preservation Act (NHPA), American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, E.O. 13007, or other statutes and executive orders. The BLM will not approve any ground disturbing activities that may affect any such properties or resources until it completes its obligations under applicable requirements of the NHPA and other authorities. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized or mitigated.
CSU 12-1	**CONTROLLED SURFACE USE STIPULATION** Surface occupancy or use is subject to the following special operating constraint: Prior to surface disturbance on slopes over 30 percent, an engineering/reclamation plan must be approved by the authorized officer.
CSU 12-4	**CONTROLLED SURFACE USE STIPULATION** All surface-disturbing activities, semi-permanent and permanent facilities in Visual Resource Management (VRM) Class II areas may require special design, including location, painting and camouflage, to blend with the natural surroundings and meet the visual quality objectives for the area.
LN 14-1	**LEASE NOTICE** Land Use Authorizations incorporate specific surface land uses allowed on Bureau of Land Management (BLM) administered lands by authorized officers and those surface uses acquired by BLM on lands administered by other entities. These BLM authorizations include rights-of-way, leases, permits, conservation easements, and recreation and public purpose leases and patents.
LN 14-11	**LEASE NOTICE GREATER SAGE-GROUSE HABITAT** The lease may in part, or in total contain important Greater Sage-Grouse habitats as identified by the BLM, either currently or prospectively. The operator may be required to implement specific measures to reduce impacts of oil and gas operations on the Greater Sage-Grouse populations and habitat quality. Such measures shall be developed during the application for permit to drill on-site and environmental review process and will be consistent with the lease rights granted.
LN 14-12	**LEASE NOTICE PALEONTOLOGICAL RESOURCE INVENTORY REQUIREMENT** This lease has been identified as being located within geologic units rated as being moderate to very high potential for containing significant paleontological resources. The locations meet the criteria for class 3, 4 and/or 5 as set forth in the Potential Fossil Yield Classification System, WO IM 2008-009, Attachment 2-2. The BLM is responsible for assuring that the leased lands are examined to determine if paleontological resources are present and to specify mitigation measures. Guidance for application of this requirement can be found in WO IM 2008-009 dated October 15, 2007, and WO IM 2009-011 dated October 10, 2008. Prior to undertaking any surface-disturbing activities on the lands covered by this lease, the lessee or project proponent shall contact the BLM to determine if a paleontological resource inventory is required. If an inventory is required, the lessee or project proponent will complete the inventory subject to the following: • the project proponent must engage the services of a qualified paleontologist, acceptable to the BLM, to conduct the inventory. • the project proponent will, at a minimum, inventory a 10-acre area or larger to incorporate possible project relocation which may result from environmental or other resource considerations. paleontological inventory may identify resources that may require mitigation to the

Stipulation Number	Stipulation Name/Brief Description
	satisfaction of the BLM as directed by WO IM 2009-011.incorporate possible project relocation which may result from environmental or other resource considerations. paleontological inventory may identify resources that may require mitigation to the satisfaction of the BLM as directed by WO IM 2009-011.
LN 14-14	LEASE NOTICE CULTURAL VISUAL SETTING The lease is located adjacent to known historic properties that are or may be eligible for listing on the National Register of Historic Places (NRHP). The lease may in part or whole contribute to the importance of the historic properties and values, and listing on the NRHP. The operator may be required to implement specific measures to reduce impacts of oil and gas operations on historic properties and values. These measures may include, but are not limited to, project design, location, painting and camouflage. Such measures shall be developed during the on-site inspection and environmental review of the application for permit to drill (APD), and shall be consistent with lease rights. The goal of this Lease Notice is to provide information to the lessee and operator that would help design and locate oil and gas facilities to preserve the integrity and value of historical properties that are or may be listed on the National Register of Historic Places. This notice is consistent with the present Montana guidance for cultural resource protection related to oil and gas operations (NTL-MSO-85-1).
LN 14-15	**LEASE NOTICE SPRAGUE'S PIPIT** The lease area may contain habitat for the federal candidate Sprague's pipit. The operator may be required to implement specific measures to reduce impacts of oil and gas operations on Sprague's pipits, their habitat, and overall population. Such measures would be developed during the application for permit to drill and environmental review processes, consistent with lease rights. If the US Fish and Wildlife Service lists the Sprague's pipit as threatened or endangered under Endangered Species Act, the BLM would enter into formal consultation on proposed permits that may affect the Sprague's pipit and its habitat. Restrictions, modifications, or denial of permits could result from the consultation process.
NSO 11-2	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within riparian areas, 100-year flood plains of major rivers, and on water bodies and streams.
NSO 11-4	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-quarter mile of grouse leks.
NSO 11-8	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-half mile of known ferruginous hawk nest sites which have been active within the past 2 years.
NSO 11-9	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-quarter mile of wetlands identified as piping plover habitat.
NSO 11-10	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-quarter mile of wetlands identified as interior least tern habitat.
NSO 11-13	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within developed recreation areas and undeveloped recreation areas receiving concentrated public use.
TES 16-2	**ENDANGERED SPECIES ACT SECTION 7 CONSULTATION STIPULATION** The lease area may now or hereafter contain plants, animals, or their habitats determined to be threatened, endangered, or other special status species. BLM may recommend modifications to exploration and development, and require modifications to or disapprove

Stipulation Number	Stipulation Name/Brief Description
	proposed activity that is likely to result in jeopardy to proposed or listed threatened or endangered species or designated or proposed critical habitat.
TL 13-1	**TIMING LIMITATION STIPULATION** No surface use is allowed within crucial winter range for wildlife for the time period December 1 to March 31 to protect crucial white-tailed deer, mule deer, elk, antelope, moose, bighorn sheep, and sage grouse winter range from disturbance during the winter use season, and to facilitate long-term maintenance of wildlife populations. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-3	**TIMING LIMITATION STIPULATION** No surface use is allowed from March 1 to June 15 in grouse nesting habitat within two miles of a lek. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-4	**TIMING LIMITATION STIPULATION** No surface use is allowed within one-half mile of raptor nest sites which have been active within the past 2 years during the time period March 1 - August 1 to protect nest sites of raptors which have been identified as species of special concern. This stipulation does not apply to operation and maintenance of production facilities.

Appendix C
Reasonably Foreseeable Development Scenario Forecast for the October 21, 2014 Lease Sale

The Reasonably Foreseeable Development (RFD) scenario for the area of analysis is based on information contained in the MCFO RFD developed in 2005 and revised in 2012; it is an unpublished report that is available by contacting the MCFO. The MCFO RFD contains projections of the number of possible oil and gas wells that could be drilled and produced in the MCFO area and it is used to analyze the projected wells for the 18 nominated lease parcels, located in Richland, Roosevelt, McCone, Prairie, and Powder River counties, proposed for the October 21, 2014 lease sale.

The MCFO RFD contains projections of the number of possible oil and gas wells that could be drilled and produced within each of the three development potential areas specified as high, medium, and low potential areas. GIS was used to determine the number of projected new federal wells within each development potential by taking into consideration the same assumptions and methodology used to determine the MCFO RFD. To project the number of Federal wells on the nominated acres, the proportionate percentage of nominated lease acres within the high, medium, or low potential RFD area is multiplied by the respective total number of high, medium, or low potential projected wells. Where the number of wells in a parcel within a county had a projection of equal to or greater than 1 in 1000 (0.001) the well number was rounded up to one, if the number of wells projected in a parcel within a county had a projection of less than 1 in 1000 (.001) the well number was rounded to zero.

These well numbers are only an estimate based on the MCFO RFD which is based on USGS assessments, past and current development, resource expertise, and MBOCG feedback and data, and may change in the future if new technology is developed or new fields and formations are discovered.

High Potential
The ~~6,005~~ 6,026 lease parcel acres located in McCone, Powder River, Richland, and Roosevelt Counties are in the area of High Potential (6,043,000 acres total) development. The RFD scenario forecasts a range of 856 to 1,711 oil wells and 1,004 to 2,009 gas wells in this development area. The range for federal wells is 197 to 394 oil wells and 231 to 462 gas wells. The High Potential lease parcels total approximately 6,005 acres, approximately 0.099 percent of the High Potential project area identified in the RFD.

Medium Potential
No lease parcels nominated lie within the area of Medium development potential.

Low Potential
The ~~1,599~~ 1,919 lease parcel acres located in Prairie County are in the area of Low Potential (13,120,000 acres total) development. The RFD scenario forecasts a range of 325 to 650 oil wells and 382 to 764 gas wells in this development area. The range for federal wells is 197 to 394 oil wells and 231 to 462 gas wells. The Low Potential lease parcels total

approximately ~~1,599~~ 1,919 acres, approximately 0.012 percent of the Low Potential project area identified in the RFD.

Table 1. Nominated Lease Parcel Acres Offered within each County by Alternative

Alternative	Richland	Roosevelt	McCone	Prairie	Powder River
Alt A	0	0	0	0	0
Alt B	~~1148~~ 1189	200	40	~~1599~~ 1,919	~~4617~~ 4597
Alt C	~~37~~ 0	~~0~~ 80	0	~~1039~~ 521	~~80~~ 597

Table 2. Projected Number of Wells within each County by Alternative

Alternative	Richland	Roosevelt	McCone	Prairie	Powder River
Alt A	0	0	0	0	0
Alt B	1	1	1	1	3
Alt C	~~1~~ 0	~~0~~ 1	0	1	1

Appendix D - Potential Surface Disturbance Associated with Federal Wells

The potential number of acres disturbed by federal wells and associated access road and utility corridor is shown in Table D-1. The potential acres of disturbance reflect acres typically disturbed by construction, drilling, and production activities, including infrastructure installation throughout the MCFO. Typical federal wells and associated access road and utility corridor acres of disturbance were used as assumptions for analysis purposes in this EA. The assumptions were not applied to Alternative A because the lease parcel would not be recommended for lease; therefore, no wells would be drilled or produced on the lease parcel and no surface disturbance would occur on those lands from exploration and development activities.

Estimated average acres of surface disturbance associated with well pad and access road/utility corridor are based on current disturbance of oil, gas, and CBNG APDs being permitted in the MCFO within the last five years.

Standard oil and gas practice typically combines access road and utility corridor (oil/gas/CBNG, water, and power) within the same corridor to minimize surface disturbance which requires a wider corridor but limits overall surface disturbance.

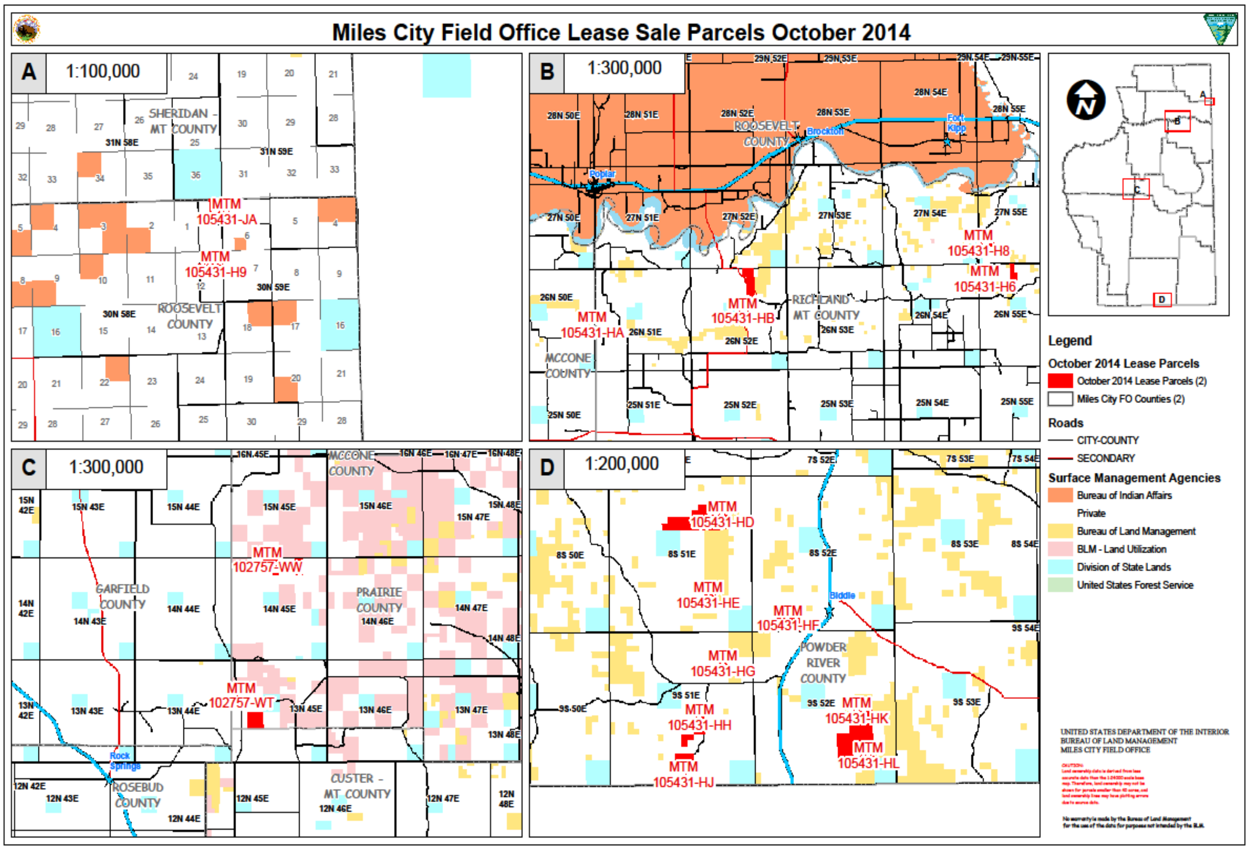
It is unknown how many wells would be drilled on multi-well pads; therefore to assist in determining acres of surface disturbance, it is assumed that one well would be drilled on one well pad.

Table D-1. Estimated Acres of Disturbance Associated with a Federal Well Pad and Access Road and Utility Corridor.

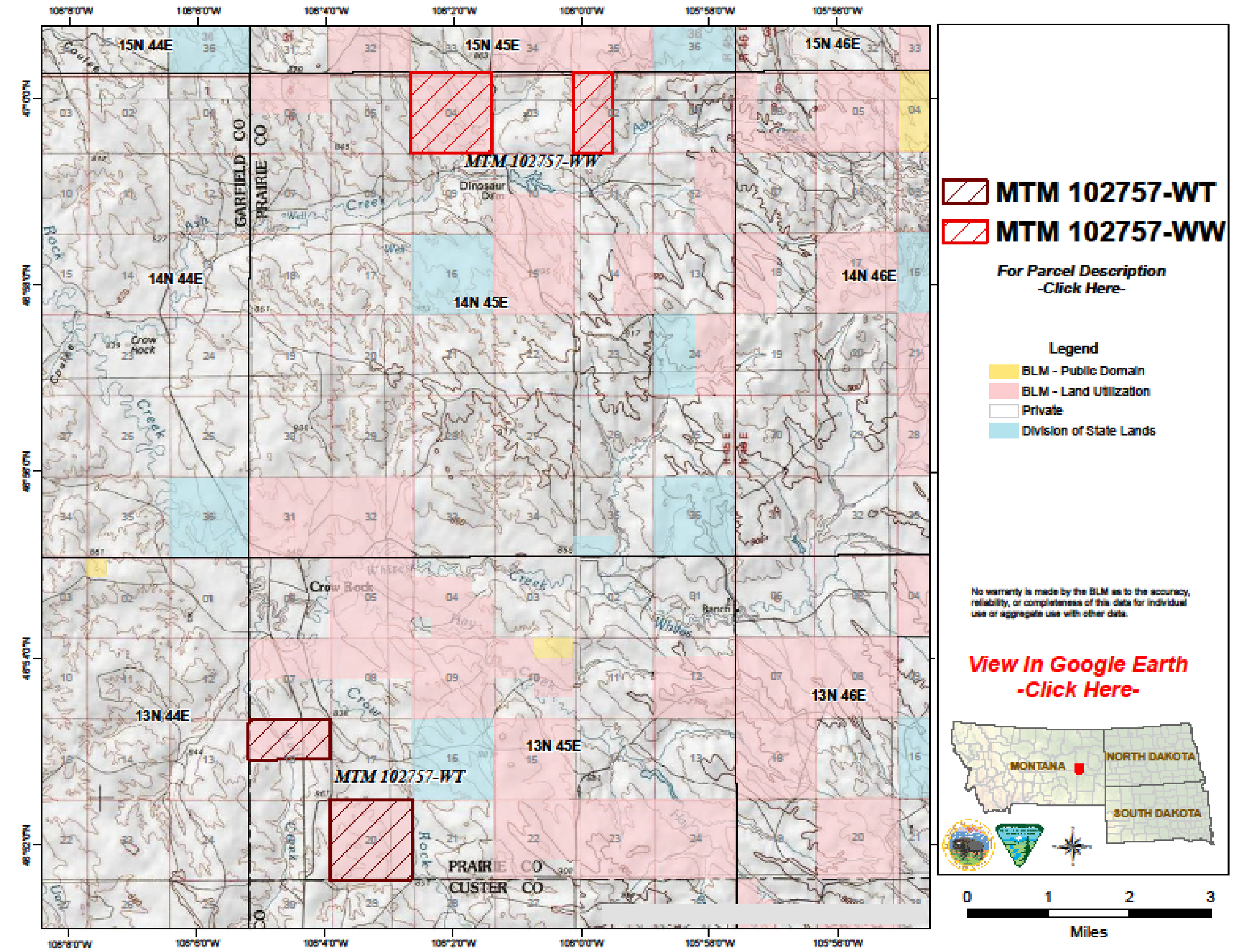
	Well Pad	**Access Road/Utility Corridor**	**Total Disturbance**
Oil	3.00	1.20	4.20
Gas	0.50	0.55	1.05
CBNG	0.25	0.55	0.80

Surface disturbance associated with major transportation lines, processing production areas, produced water management areas may not be included as part of the federal APD for permitting. It may be permitted and constructed in association with another APD; therefore, surface disturbance from associated infrastructure it is not included as acres of surface disturbance per well or access road/utility corridor listed in the table.

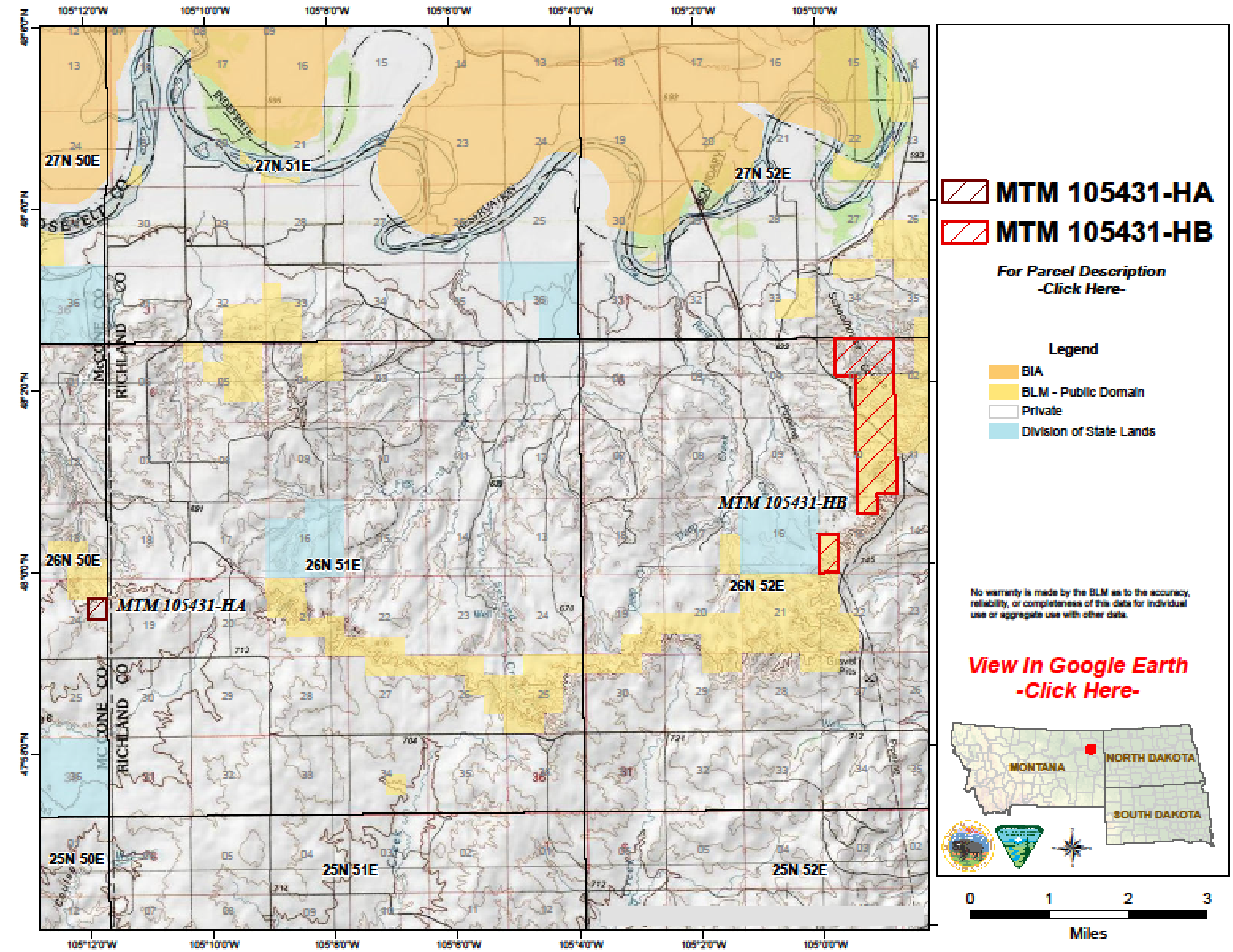
Map 1. All Nominated Lease Parcels



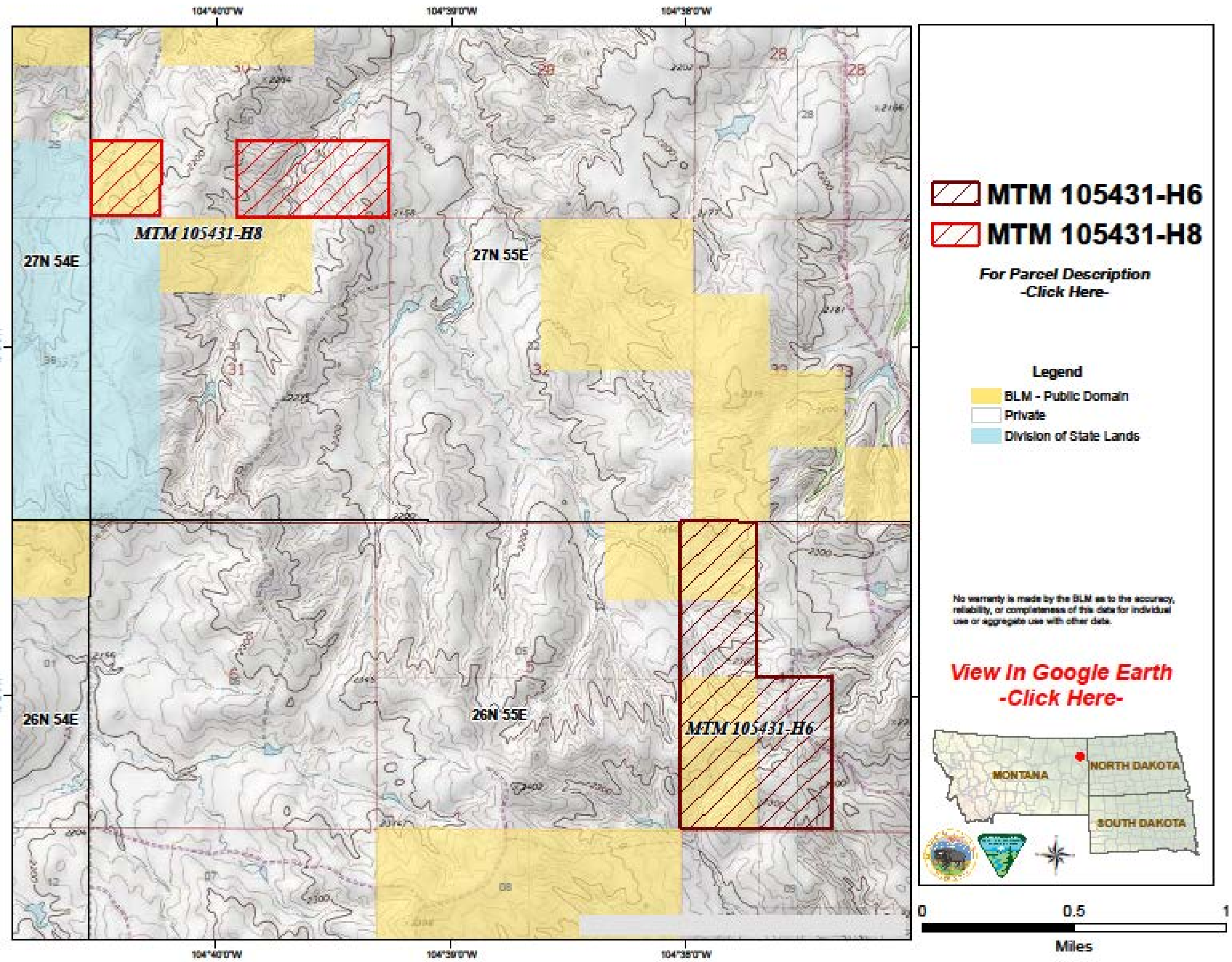
Map 2. Nominated Parcels MTM 102757-WT & MTM 102757-WW



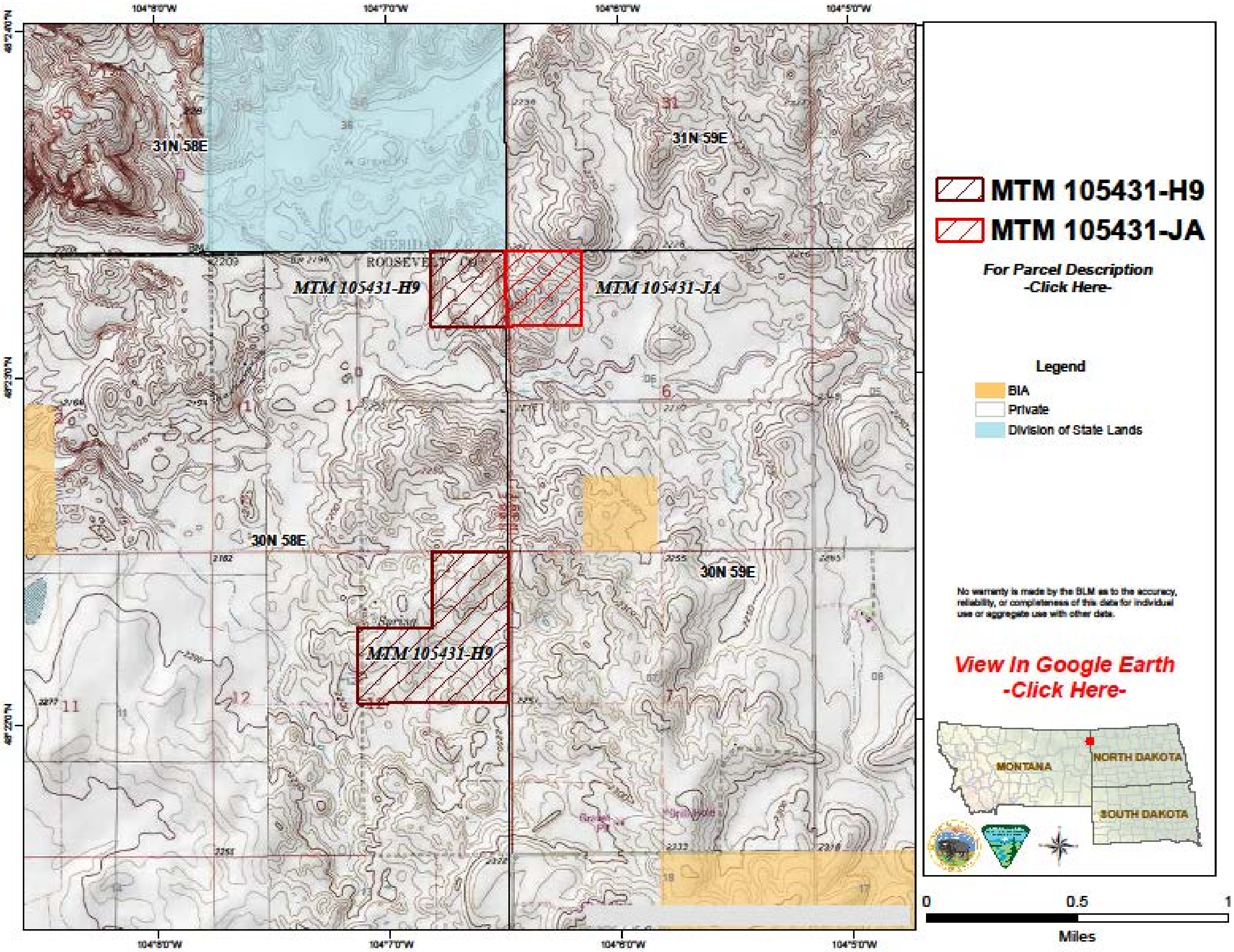
Map 3. Nominated Parcels MTM 105431-HA & MTM 105431-HB



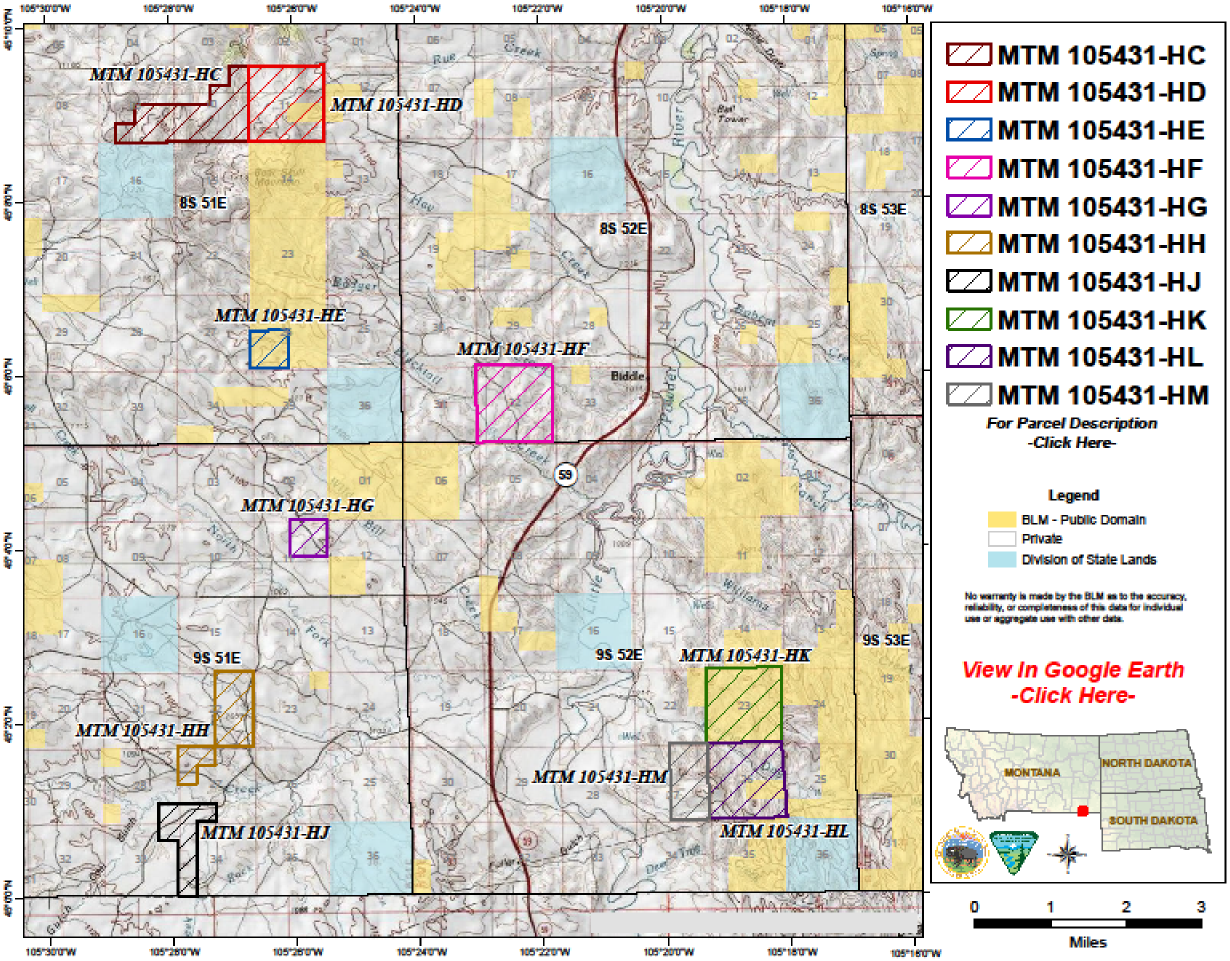
Map 4. Nominated Parcels MTM 105431-H6 & MTM 105431-H8



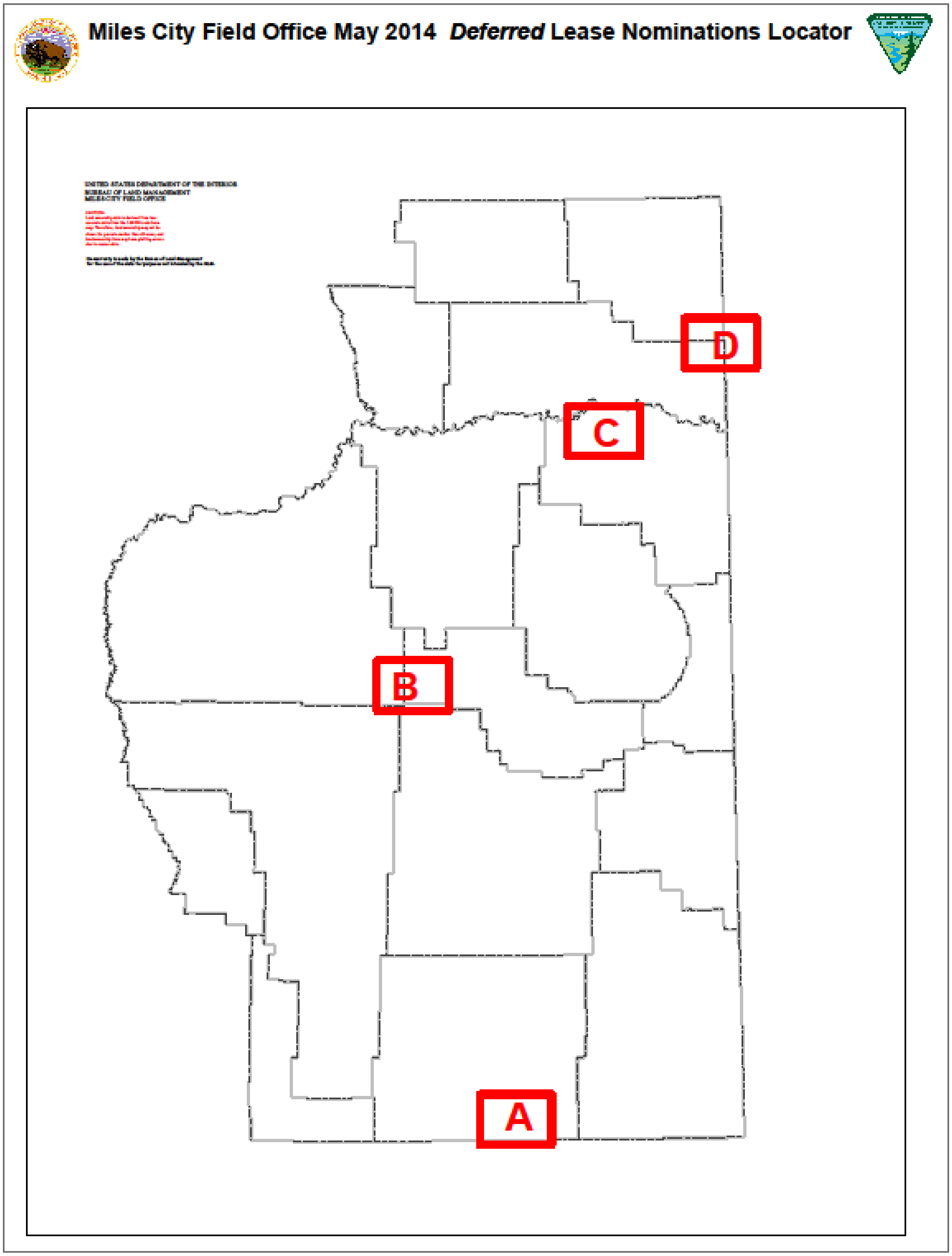
Map 5. Nominated Parcels MTM 105431-H9 & MTM 105431-JA



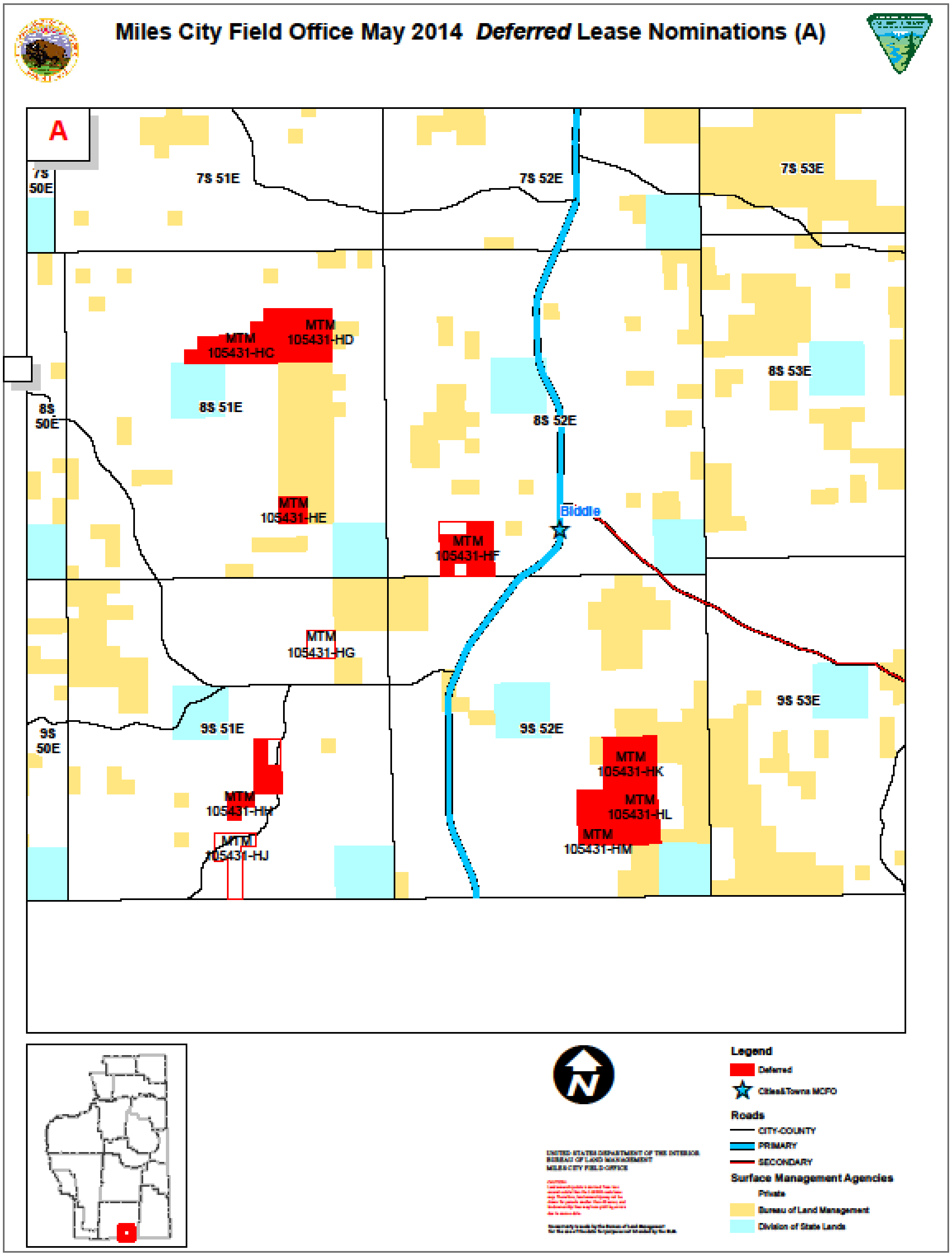
Map 6.   Nominated Parcels MTM 105431-HC, HD, HE, HF, HG, HH, HJ, HK, HL, & HM



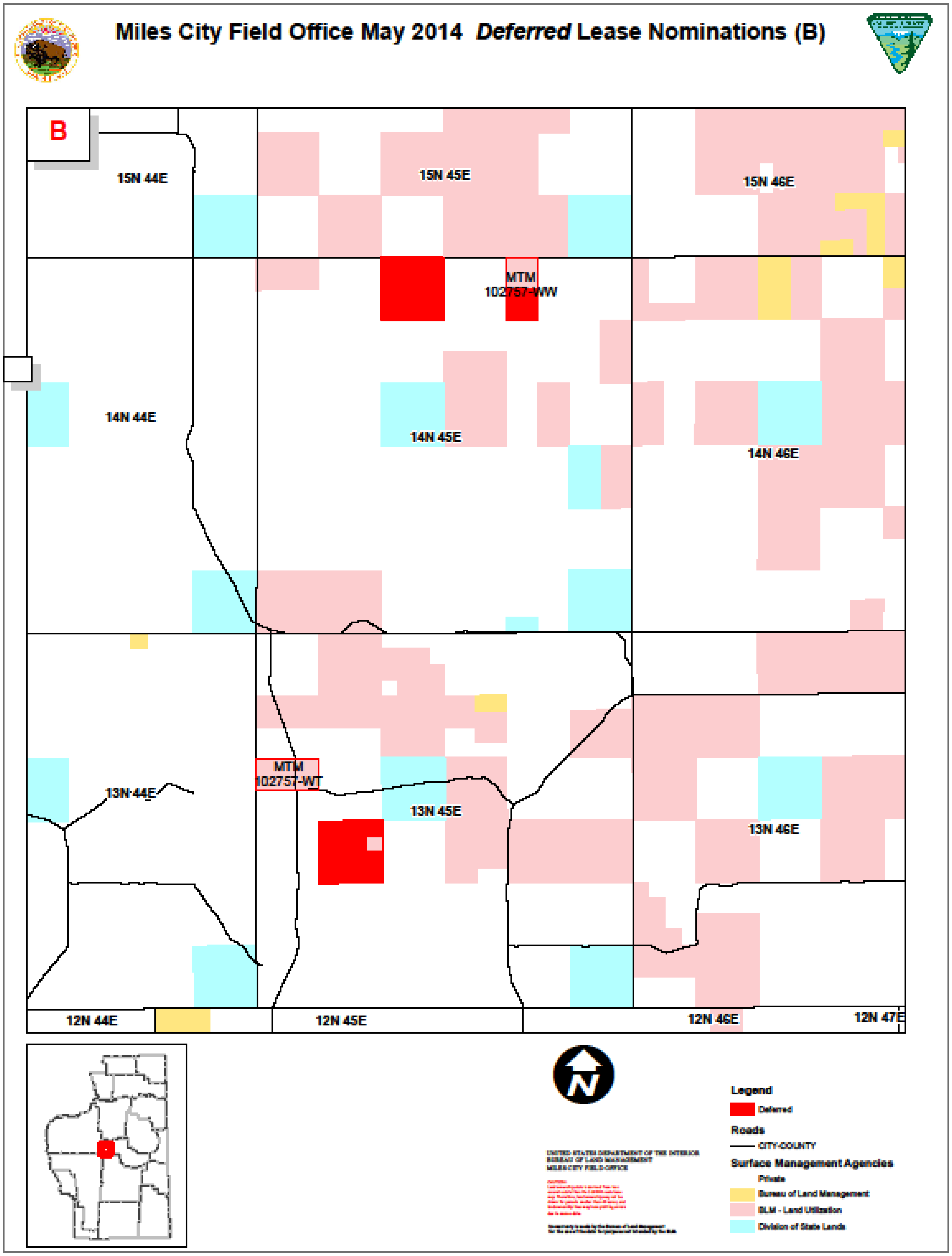
Map 7 – Deferred Parcel Areas within the MCFO



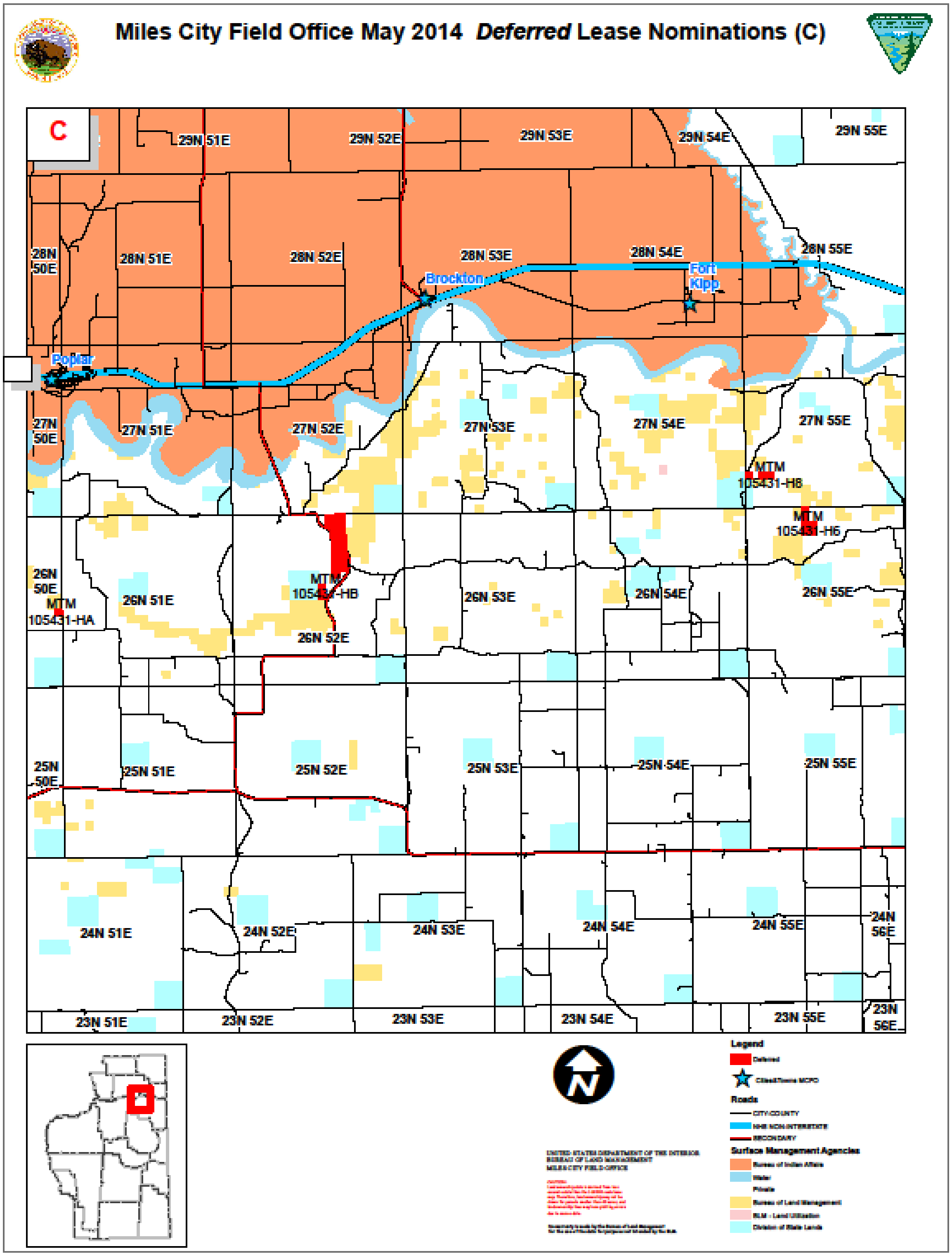
Map 8 – Deferred Parcels in Powder River County Area



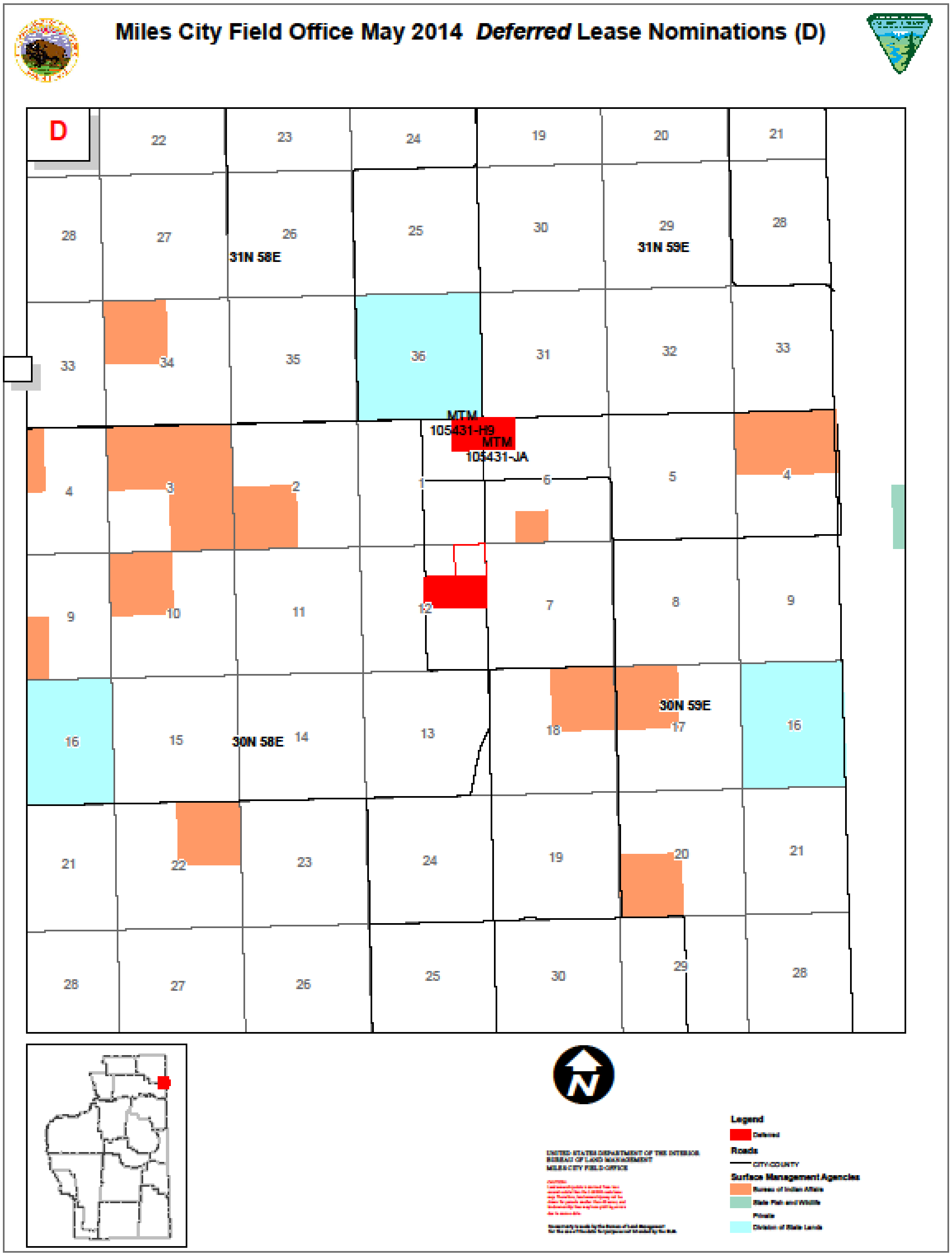
Map 9 – Deferred Parcels in Prairie County Area



Map 10 – Deferred Parcels in McCone and Richland County Areas



Map 11 – Deferred Parcels in Roosevelt County Area



Canada lynx persist in spruce beetle impacted forests, research shows

By Joshua Rapp Learn

Posted on February 2, 2016

Lynx kittens. ©James Weliver/USFWS

Lynx are making good use of some sections of forest impacted by spruce beetles, according to ongoing research.

"The notion before we started the study was that it was possibly not lynx habitat because it's very different from what we traditionally think of as lynx habitat," said John Squires about an area in Rio Grande National Forest that was struck by an outbreak of spruce beetles (*Dendroctonus rufipennis*) in 2013. Squires is a research wildlife biologist at the Rocky Mountain Research Station of the U.S. Forest Service and a member of The Wildlife Society.

But his research found that Canada lynx (*Lynx canadensis*) live and produce kittens in certain parts of beetle-killed forests.

Squires and other project collaborators, including Colorado Parks and Wildlife, Rio Grande National Forest, the Rocky Mountain region of USFS, and Montana State University, trapped and put GPS collars on four cats in Colorado's Rio Grande Forest so far and will collar more animals in the future. They are also documenting the kind of vegetation in parts of the habitat where lynx live in an effort to better understand the cats' preferences.

"We're doing very detailed vegetation plots and forest mapping to look at characteristics of the live understory and the dead overstory," Squires said

They found that after spruce trees die, young fir trees take advantage of the extra space and sunlight and densely populate in some parts of the beetle-kill area. Preliminary findings show that the lynx like these areas.

The finding is important for land-use managers. If Squires and the other researchers can figure out what kind of forest the cats prefer, they can provide advice for salvage logging that could minimize impacts to lynx.

But the public and agencies want to sell the dead trees. Squires said the study is projected to continue until the end of 2017. While spruce trees can stand for decades after dying in some areas and older dead trees have some commercial uses, logging companies prefer trees that died less than five years ago.

"In general they want to salvage them as soon as they can after beetle mortality," he said. "There's some urgency to figure out how to do that while still conserving lynx."

On a larger scale, Squires said this research is part of his larger interest in seeing how lynx respond to natural disturbance like beetle kills, fires as they relate to climate change.

The U.S. Forest Service is a Premier Partner of TWS.

Joshua Rapp Learn is a science writer at The Wildlife Society.
Read more of Joshua's articles.

Canada Lynx Central Plains and Mountains Colorado spruce beetles

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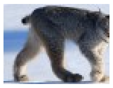
By Nala Rogers



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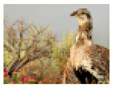

Greater Sage-Grouse Population Grows in Wyoming
By Joshua Rapp Learn

Quotable

"The conference was inspirational, educational and enjoyable. It was especially encouraging to see so many younger scientists, eager to carry forward the great traditions of conservation and wildlife management. Thanks to The Wildlife Society, the future bodes well for the profession."

—Steve Kallick, Director of

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2014 and beyond.

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California Leads Nation in Wind Turbine Eagle Deaths

At least 27 golden eagles perished at 13 California wind turbine facilities between 1997 and June 2012, with a startling rise in reported mortalities in 2011. That's not including the eagle killing machines at Altamont Pass.

Federal Lab Offers Grim Look at Solar Harm to Wildlife

A report just made public by the U.S. Fish and Wildlife Service documents a disturbing amount of bird injuries at three large California desert solar power plants, and says that there are no easy fixes to the issue.

REDEFINE

USFWS: Mysterious 'Funnel Effect' Harming Wildlife at Unnamed Solar Plant

We're guessing that USFWS knows something we don't about wildlife mortalities at the Ivanpah Solar Electric Generating System.

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Turbine Eagle Deaths

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Solar Farms Threaten Birds

Certain avian species seem to crash into large solar power arrays or get burned by the concentrated rays

By John Upton, Climate Central on August 27, 2014

Yuma clapper rail. *Credit: Fish & Wildlife Services*

You might never have seen an Yuma clapper rail. Fewer than 1,000 are thought to still be sloshing about in cattail-thick marshes from Mexico up to Utah and across to

California. But if you were lucky enough to spot one, you might chuckle at its oversized toes.

When officials with the National Fish and Wildlife Forensics Laboratory saw one of these endangered birds last year, it was no laughing matter. It was dead. It was one of 233 birds recovered from the sites of three Californian desert solar power plants as part of a federal investigation. The laboratory's wildlife equivalents of CSI stars concluded that many of the birds had been fatally singed, broken, or otherwise fatally crippled by the facilities.

Last week, that long-dead clapper rail stoked a legal action that challenges at least a half dozen additional solar plants planned in California and Arizona.

Conservationists say they're also worried about yellow-billed cuckoos, which might be added to the federal government's list of threatened species, and endangered southwestern willow flycatchers, though none of those birds have been found dead at any of the solar sites.

The effects of wind turbines on birds, which research suggests kill far fewer birds per megawatt hour than do fossil fuel plants, have long been a source of consternation for many environmentalists. Their bird-killing effects have been serious enough to kill and hamper some planned projects. Now, as concentrated solar farms start to sweep the globe, solar energy developers are facing similar outcries and opposition for the harm that their clean energy facilities can cause to wildlife.

The construction of solar panel farms and concentrated solar power are both booming businesses. In California, industrial-scale facilities like these are helping utilities meet a state mandate that 20 percent of electricity sold by 2017 is renewable. But if the problem of wildlife impacts festers, the growth of concentrated solar, which by one recent estimate could grow to a $9 billion worldwide industry in 2020, up from $1 billion in 2013, could be crimped by lawsuits and opposition from conservationists.

Much of the problem appears to lie in the “lake effect,” in which birds and their insect prey can mistake a reflective solar facility for a water body, or spot water ponds at the site, then hone in on it. Because of the power of the lake effect, the federal investigators described such solar farms as “mega-traps” in their report.

“I strongly believe there’s a way to show the birds that the PV panels are solid surfaces, not water,” said Ileene Anderson, a scientist at the Center for Biological Diversity, which is preparing to sue over Yuma clapper rail mortality at solar power plants.

The Associated Press reported last week on “streamers” at BrightSource Energy’s concentrated solar plant -- a futuristic-looking facility that gamers pass as they drive through the desert between Las Vegas and Los Angeles. That’s the name given to birds as their feathers ignite, mid-air, after flying through a concentrated beam of sunlight. Such hapless birds can be burned to death, killed by brute force when they crash to the ground, or eaten a predator swoops in to claim their maimed body. These are just some of the ways that large solar plants can kill birds. It’s not known how many birds are being felled by the groundswell of such facilities, but the numbers are high enough to concern bird and conservation groups -- regardless of the environmental benefits of solar power.

“We can safeguard our irreplaceable wildlife, like the Yuma clapper rail, through thoughtful implementation of renewable energy projects,” Anderson said.

Within days of the AP report, Anderson’s group, which had obtained the federal report through a public records request, dispatched a notice of intent to sue. In the letter, an attorney for the group threatened to take the U.S. Department of the Interior, U.S. Fish & Wildlife Service, and U.S. Bureau of Land Management to court in 60 days unless the agencies agreed to more thoroughly review the potential bird impacts of other large solar power plants proposed within the Yuma clapper rail’s range. The notice alleges violations of the Endangered Species Act.

The attorney cites findings from the federal investigation report, which showed that the Yuma clapper rail had been killed at First Solar’s 4,400-acre Desert Sun Solar

Farm in California's Riverside County. The facility uses a 550-megawatt photovoltaic array that produces clean electricity for Californian utility customers. (The group also cited a media report of another Yuma clapper rail death at a similar facility.) Birds can be killed when they smash into the facility's solar panels, the investigation concluded.

The other solar farms analyzed by the investigators were of the newfangled trough and solar power tower varieties. They included the Genesis Solar Energy Project, also in Riverside County, which uses a trough system in which parabolic mirrors focus sunrays into a tube where water boils into steam that spins a turbine to produce electricity. The mirrors pose similar threats to birds as solar panels. The third facility studied was the Ivanpah Solar Electric Generating System in Bernardino County, Calif., where birds can be burned as they pass through concentrated sunrays that are reflected off thousands of mirrors toward a solar power tower, where water is boiled to produce electricity-generating steam.

The problem of bird deaths at solar power farms is a complex one. Some solar developers have been powering down bright lights that had attracted insects at night, or switching to LEDs, and using nets to keep birds at bay. But that apparently is not enough. "The diversity of birds dying at these solar facilities, and the differences among sites, suggest that there is no simple 'fix' to reduce avian mortality," the federal report states.

The report recommends improving bird- and bat-death monitoring through the use of sniffer dogs, video cameras, and daily surveys. It also lists recommendations for directly reducing avian mortality. Those recommendations include clearing vegetation around solar towers to make the area less attractive to birds, retrofitting panels and mirrors with designs that help birds realize the solar arrays are not water, suspending operations at key migration times, and preventing birds and bats from roosting and perching at the facilities. The recommendations are being considered by regulators.

The Center for Biological Diversity supports those proposed measures. It also suggests restoring bird habitat elsewhere to draw birds away from the solar facilities, which could help the rails and other species recover. And it wants the government to undertake new scientific research -- research that could offer clues for better protecting birds from solar power farms.

“We’d like the FWS to start looking at the potential problem that the Yuma clapper rail may be being attracted onto the sites,” Anderson said. “These large-scale solar projects in the desert are giant experiments, and we should be learning something from them in order to avoid and minimize impacts. We’re so low on the learning curve that there’s a lot of unanswered questions.”

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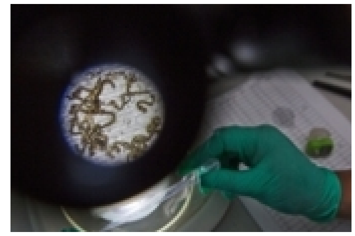

Climate Change

Evaluating Climate Policy Options, Costs and Benefits

On This Page

- Common-sense Approaches Through the Clean Air Act
- Analysis of Proposed Climate Legislation
- Understanding Benefits
- Research Underlying EPA Economic Modeling of Climate Policies

EPA analyzes the anticipated economic effects of proposed standards and policies to reduce greenhouse gas emissions. These analyses have shown that there are a variety of cost-effective policies available to reduce greenhouse gas emissions.

Policy options range from comprehensive market-based legislation to targeted regulations to reduce emissions and improve the efficiency of vehicles, power plants and large industrial sources. Underlying these analyses are economic models and detailed studies of technologies to reduce emissions.

Common-sense Approaches Through the Clean Air Act

EPA is taking action under the Clean Air Act to reduce greenhouse gas emissions from the largest sources by increasing the efficiency of our power plants, cars, and trucks. Our analyses show that these regulations will save consumers money at the pump, improve the air we breathe, promote jobs in the green technology sector, and cut millions of tons of harmful greenhouse gas emissions.

- EPA's regulatory initiatives for greenhouse gases under the Clean Air Act
- Historical economic benefits from taking action under the Clean Air Act

Analysis of Proposed Climate Legislation

Congress periodically proposes legislation to lower greenhouse gas emissions, and EPA economists analyze these bills as part of the legislative process. EPA analyses have shown that comprehensive, market-based climate legislation can transform the U.S. energy system and reduce greenhouse gas emissions, all at relatively low cost.

- EPA Legislative Analyses
- Climate Economic Modeling

Understanding Benefits

Taking actions to reduce greenhouse gas emissions yields important economic benefits. These benefits are from the reduced risk to human health and welfare that results from lower emissions of greenhouse gases and less global warming and climate change. EPA and other federal agencies have developed Social Cost of Carbon (SC-CO_2) estimates to assess the economic benefits of rulemakings that reduce carbon dioxide (CO_2) emissions. When agencies prepare to issue regulations implementing the laws enacted by Congress, they must justify proposed regulations by assessing their cost and benefits to the economy and society. The SC-CO_2 is typically used in the benefits part of the cost-benefit analysis. For a regulation that decreases emissions, the SC-CO_2 represents the damage avoided--or the benefit of the regulation--for marginal reductions of CO_2.

As discussed in the supporting technical documentation, (PDF, 21pp, 1.4MB) however, these benefit estimates are not complete because current models do not yet capture all of the important physical, ecological, and economic impacts of rising levels of CO_2 in the atmosphere that are recognized in the literature. Nonetheless, these estimates and the discussion of their limitations in the supporting technical documentation represent the best available information about the social benefits of CO_2 reductions to inform benefit-cost analysis.

EPA is exploring approaches to further understand the benefits of CO_2 reductions that complement the analysis conducted with the SC-CO_2. While the SC-CO_2 is a useful metric to assess marginal changes in CO_2 emissions in the context of cost-benefit analysis, bottom-up approaches, such as the Climate Change Impacts and Risks Analysis (CIRA) project, may offer additional insights about the impact of significant global action.

CIRA is a peer-reviewed study comparing impacts in a future with significant global action on climate change to a future in which current greenhouse gas emissions continue to rise.

In 2015, EPA released a report, Climate Change in the United States: Benefits of Global Action, estimating the physical and monetary benefits to the U.S. of reducing global greenhouse gas emissions. This report summarizes results from the CIRA. Although no specific mitigation policies were analyzed, the report shows that global action on climate change will significantly benefit Americans by saving lives and avoiding costly damages across the U.S. economy.

Research Underlying EPA Economic Modeling of Climate Policies:

Climate Economic Modeling

EPA uses a variety of economic models and analytical tools when conducting climate economic analyses of climate legislation or policy. These models help researchers estimate the future effects of proposed policies on energy production, the economy, emissions of CO_2, and land use trends in agriculture and forestry.

Air Quality and Climate Modeling

EPA is creating decision support tools to evaluate policy options for both air quality and climate change

Transportation Sector Analyses

EPA conducts modeling and feasibility analyses to understand the potential of technologies and strategies to reduce greenhouse gas emissions from the transportation sector.

International Emissions Projections for Non CO_2 Gases

EPA conducts studies of projected global emissions of the methane, nitrous oxide, and fluorinated greenhouse gases which account for about 30 percent of human-caused warming. Projected emissions studies for the non-CO_2 gases provide a benchmark that can be used to measure the potential environmental and economic impact of proposed climate policies across all relevant gases.

International Mitigation Technologies to Reduce Emissions of Non CO_2 Gases

Numerous technologies are available to reduce emissions of methane, nitrous oxide, and fluorinated greenhouse gases. EPA develops reports that evaluate the costs of various technologies to reduce non-CO_2 greenhouse gas emissions. These reports also provide cumulative marginal abatement cost curves which are used by researchers to represent mitigation costs in their models.

Last updated on October 6, 2016

What is an INDC?

What is an INDC?

Countries across the globe adopted an historic international climate agreement at the U.N. Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP21) in Paris in December 2015. In anticipation of this moment, countries publicly outlined what post-2020 climate actions they intended to take under the new international agreement, known as their Intended Nationally Determined Contributions (INDCs). The climate actions communicated in these INDCs largely determine whether the world achieves the long-term goals of the Paris Agreement: to hold the increase in global average temperature to well below 2°C, to pursue efforts to limit the increase to 1.5°C, and to achieve net zero emissions in the second half of this century.

For tools, blog posts and publications related to INDCs, visit our INDC resources page.

How does the process work?

INDCs pair national policy setting — in which countries determine their contributions in the context of their national priorities, circumstances and capabilities — with a global framework under the Paris Agreement that drives collective action toward a zero-carbon, climate-resilient future.

The INDCs create a constructive feedback loop between national and international decision-making on climate change.

INDCs are the primary means for governments to communicate internationally the steps they will take to address climate change in their own countries. INDCs reflect each country's ambition for reducing emissions, taking into account its domestic circumstances and capabilities. Some countries also address how they'll adapt to climate change impacts, and what support they need from, or will provide to, other countries to adopt low-carbon pathways and to build climate resilience.

Do INDCs stay "intended"?

The word “intended” was used because countries were communicating proposed climate actions ahead of the Paris Agreement being finalized. However as countries formally join the Paris Agreement and look forward to implementation of these climate actions – the “intended” is dropped and an INDC is converted into a Nationally Determined Contribution (NDC).

This conversion happens when a country submits its respective instrument of ratification, accession, or approval to join the Paris Agreement. For more information on this process refer to WRI’s blog posts on *entry into force* and *conversion of INDCs to NDCs*.

Under the provisions of the Paris Agreement, countries will be expected to submit an updated NDC every five years, which will represent a progression beyond the country’s then current NDC to reflect its highest possible ambition.

Where can we see the INDCs and NDCs?

All but a small handful of countries have now submitted their INDCs. Visit WRI’s interactive Paris Contributions Map to track for all of these INDCs and a summary of the climate actions communicated by each country the commitments.

All INDCs submitted by October 1st 2015 were included in a synthesis report by the UNFCCC Secretariat that was released in November 2015, and updated in May 2016. The report reflects the aggregate emissions impact of INDCs.

Many countries have also already converted their INDCs to NDCs. For a list of those countries that have converted their INDC to their first NDC, visit the UNFCCC’s *NDC Registry*.

What makes a good INDC?

Well-designed INDCs signal to the world that the country is doing its part to combat climate change and limit future climate risks. In preparing their INDCs, countries should have followed a transparent process in order to build trust and accountability with domestic and international stakeholders. A good INDC should be **ambitious**, leading to transformation in carbon-intensive sectors and industry; **transparent,** so that stakeholders can track progress and ensure countries meet their stated goals; and **equitable,** so that each country does its fair share to address climate change.

It is important that INDCs be clearly communicated so domestic and international stakeholders can anticipate how these actions will contribute to global emissions reductions and climate resilience in the future. An INDC should also articulate how the country is integrating climate change into other national priorities, such as sustainable development and poverty reduction, and send signals to the private sector to contribute to these efforts.

What has WRI done on this topic?

WRI has worked, and is working, on a variety of projects that aim to assist governments in developing and implementing their INDCs and NDCs, assessing, tracking INDCs and helping stakeholders to understand and evaluate INDCs and NDCs.

WRI's Open Climate Network worked with partners in eight focus countries to evaluate current emissions trends and abatement potential out to 2030, a process which helped inform initial INDCs. Now, OCN and its partners are using analysis and modeling to understand the policy options for delivering on INDCs in major emitting countries. This data provides critical information to decision-makers in the world's largest economies as they work towards implementing their INDCs.

WRI works through our Open Book initiative to enhance INDC transparency. Our CAIT Paris Contributions Map tracks and analyzes INDCs.

Our ACT 2015 project helped catalyze agreement at COP21, including the ways in which countries' commitments and other actions from their INDCs were finalized and linked to the 2015 agreement.

In partnership with the UNDP, WRI prepared an INDC guidance document to support the detailed design and preparation of INDCs, including for mitigation and adaptation components.

WRI has also developed a framework and guidance for countries on how to develop and communicate an INDC that is fair and ambitious.

WRI prepared a short framework, called Decoding INDCs, to aide understanding of key elements of the INDCs. Decoding INDCs is also available in French and Spanish.

Where can I learn more?

INDC resources page

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CLIMATE CHANGE ENVIRONMENTAL ACTIVISM GLOBAL SOUTH

With a 1.5 Degrees Celsius Target, the Climate-Justice Movement Is Poised to Score a Surprise Win

Pressure from activists and vulnerable countries has shifted the discussion away from a 2 degrees C target—a virtual death sentence for millions of people.

By *Mark Hertsgaard*

DECEMBER 7, 2015

Hundreds of environmentalists arrange their bodies to form a message of hope and peace in Paris, France, as the World Climate Change Conference 2015 (COP21) continues near the French capital. *(Reuters / Benoit Tessier)*

Paris, France—Here at the Paris climate summit, the big

Paris, France—Here at the Paris climate summit, the big news is that the final agreement governments hope to sign by week's end may urge limiting temperature rise to 1.5 degrees Celsius. This would represent a major shift from the current international goal of 2 degrees C as well as a historic—and surprising—victory for the world's poor and most vulnerable nations. Their representatives, joined by climate-justice activists, have long criticized the 2 degrees C goal as a virtual death sentence for millions of people already suffering from the sea-level rise, harsher droughts, and other impacts unleashed by the 1 degree C of temperature rise measured to date.

"If it were New York City or London that was disappearing beneath the waves like some of these Pacific Island states are, I guarantee you there wouldn't be any debate about 2 degrees versus 1.5 degrees," Kumi Naidoo, executive director of Greenpeace International, told *The Nation*. "We need to set an official target of 1.5 C, challenging as it will be to meet it, in order to save as many people as possible."

Previously dismissed by most wealthy countries as economically unrealistic, the 1.5 degrees C target has reemerged at the Paris summit due to a confluence of factors: increased recognition by many wealthy countries that even 2 degrees C will bring ruinous changes to food, water, and other vital systems; a more unified diplomatic posture on the part of the 100-plus poor and highly vulnerable countries on record supporting a 1.5 degrees C target; and relentless pressure from civil society.

Civil society has been creative, outspoken, and even boisterous during the first week of the UN climate summit, despite the official ban on large public gatherings that canceled a massive march intended to greet world leaders arriving a week ago. If pressure is sustained during the second and final week of negotiations, said former heads of state, business executives, and climate-justice activists on Sunday, the summit could end up endorsing a long-term target of 1.5 degrees C, an agreement of unprecedented ambition.

After French authorities banned large outdoor marches in Paris following the November 13 terrorist attacks, climate activists accepted the decision but quickly devised alternative methods of making their voices heard. Thousands joined hands to form a human chain along the two-mile route of the cancelled march, while hundreds of thousands of people demonstrated in cities around the world. Also in Paris, activists placed an estimated 20,000 shoes in the Place de la République to symbolize people who were prohibited from marching. Pope Francis donated plain black dress shoes; Ban Ki-moon, the UN secretary-general, donated a pair of jogging shoes.

On Saturday, *Nation* contributors Bill McKibben and Naomi Klein hosted a mock trial of ExxonMobil at a "People's Climate Summit," held in the Parisian suburb of Montreuil. The next day, activists carried 196 office chairs through the square facing the Montreuil city hall—chairs that had been "liberated" from banks throughout France. "These chairs were requisitioned to reveal the links between the tax evasion practiced by big banks and the lack of funding needed against climate change, particularly the $100 billion a year for adaptation that wealthy countries have promised poor countries but that has been blocked by financial elites," said Cindy Wiesner of the Grassroots Global Justice Alliance. “Thirty trillion dollars disappears every year into the black hole of tax havens that these banks control, tax havens that benefit criminals and murderers—drug cartels, gun traffickers, and the banks themselves. These 196 chairs represent the 196 countries whose people deserve a seat at the table for a just global economy.”

“We need civil society to keep the pressure up for the rest of this week,” Mary Robinson, the former president of Ireland, said Sunday in remarks to a “Development and Climate Days” conference urging “zero poverty, zero emissions.” “We need to remind negotiators of what world leaders said in their speeches on Monday, which was very good,” said Robinson, who now heads the Mary Robinson Foundation for Climate Justice. “It was about ambition, it was about people, it was about justice.”

The French president, François Hollande, for example, said, “We cannot accept that the poorest countries, those with the lowest greenhouse gas emissions, are the most vulnerable. It is therefore on behalf of climate justice that we must act.” Hollande added that temperature rise must be limited to 1.5 C “if possible.”

Two days later, Jochen Flasbarth, the state secretary of Germany’s Ministry of the Environment, said the 1.5 C goal “must be mentioned” in the summit’s final agreement and confirmed that this was the official position of the German government, reported the online news service Climate

Home. Thus the 1.5 C goal has now been endorsed by the host nation of the summit as well as Europe’s strongest economy.

economy.

On Monday, a delegation from the European Parliament came to the summit to support a 2 C target, but “1.5 C is obviously a better target,” said Matthias Groote of Germany, the spokesperson for the environmental group of the delegation. Stressing that he was not authorized to take a position for the European Parliament as a whole, Groote added that, “personally, of course I would prefer a 1.5 C target. At the end of the day, it will not be as expensive as the 2 C target, so if we can achieve a global agreement on this, let’s grab that chance.”

Also on Monday, Todd Stern, the chief US negotiator in Paris, reaffirmed that the United States has heard the concerns of poor and vulnerable nations and is open to adjusting the final text regarding the 1.5 C goal. “The goal isn’t going to change, the goal is to hold the temperature [rise] as far below 2 degrees as possible,” Stern told a press conference at the Le Bourget convention center. “We are working with other countries, with our island state friends and other developing countries, and developed countries, on language toward that end.”

The agreement taking shape in the lead up to the Paris summit was “not good enough,” as it would produce at least 3 degrees Celsius of temperature rise by 2100, Robinson told *The Nation*. But the world is capable of much better, she added, noting that she had just attended an event where top business executives had pledged that their companies would achieve zero net carbon emissions by 2050.

“Carbon neutral by 2050, we will have 35 years to get there,” Richard Branson, the CEO of Virgin, said at the event organized by the self-described B Team Robinson referenced, which includes Unilever and Marks & Spencer. "It's actually just not that big a deal," Branson continued, "but we need clear long-term goals set by governments this week. Give us that goal and we will make it happen." The B Team contends that putting the world on track for zero net emissions by 2050 would also "keep the door open" to eventually limiting temperature rise to 1.5 C.

Also giving credence to the possible adoption of the 1.5 C goal in any agreement this week in Paris was Saleem ul Huq, a scholar and activist who directs the International Center for Climate Change and Development in Bangladesh. Huq has trained many of the diplomats representing the 48 Least Developed Nations at past climate summits, and he remains privy to their deliberations.

"I foresee that we will get an agreement including the 1.5 C goal," Huq told *The Nation*. "Nobody wants to walk away from Paris without an agreement, neither the rich countries nor the poor countries. The Least Developed Countries have a clear position: World leaders must agree to support and protect all of the people on earth, not just some of them. The language that rich countries are now offering would commit the world to a long-term goal of keeping temperature rise 'well below 2 C.' Poor countries, though, are insisting that the long-term goal must be 1.5 C, and I think they'll get it. President Obama and most world leaders seem receptive to this language, and we'll spend the next week beating up on any other nations that try to block it."

In the United States, mainstream media focused on war, terrorism, and presidential politics are paying relatively little attention to the Paris summit. Sunday's online edition of *The Washington Post* carried five lines about the summit; the

Sunday *New York Times* ran a single article. Mainstream European media are much more engaged; *The Guardian* in particular is providing in-depth, timely coverage.

Meanwhile, activists are relying on social media to spread their message. Huq noted that the 1.5 C goal already has its own hashtag, #1o5C, which he said supporters have been tweeting along with selfies of the 1.5 C hand signal: The pinkie of the right hand forms the 1, the other four fingers are circled to form the decimal point, and all five fingers of the left hand are spread to make the five. As he demonstrated the gesture for a reporter, Huq broke into a beaming smile.

MARK HERTSGAARD Mark Hertsgaard, *The Nation*'s environment correspondent, is the author of seven books, including *On Bended Knee: The Press and the Reagan Presidency*.